The Electrical Industry's Weekly Magazine July 31, 1961

Electrical World

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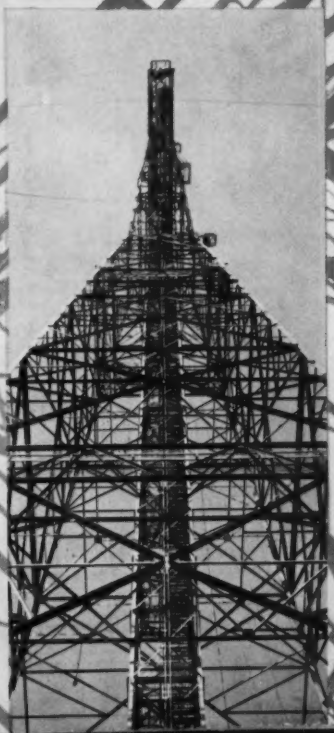
LONGEST SINGLE SPAN

IN THE EASTERN STATES

PAGE 32



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Electrical World

July 31, 1961
Vol. 156, No. 5

Dateline . . .

President Backs Off From Early Promises

Washington, D. C.—Pres Kennedy's statement to Congress, accompanying the proposed "Water Resources Council" legislation, indicates how the new Administration is backing away from some of its earlier, more liberal and controversial promises.

His statement said that, if and when the water council was approved by Congress, he would make its first job to revise present feasibility standards (A-47) for federal multipurpose water and power projects (EW, July 24, p 25).

The statement indicates two things: **(1)** Pres Kennedy has slowed down on his Feb. 23 request for a 90-day review of feasibility standards by the Budget Bureau, **(2)** The water council plan is one more spadeful of dirt he has heaped on his Sept. 23, 1960, promise, in Billings, Mont., to set up a similar —but broader—natural resources council.

Although the *water* council, with its attendant river basin commissions and federal-to-state grants, certainly indicates the "New Frontier" is still "moving forward," credit for these plans must go to the Senate Select Water Resources Committee, now defunct, which recommended them almost verbatim last January.

None of this is intended to suggest that the new Administration hasn't moved toward more federal ownership, or won't move that way still further. But it does show how a few months in office has brought the President down to reality—does show what he reasonably can expect to carry out and live with.

Organization of the water council would differ from the natural resources group, in that only the water council would be headed by Secretaries of the Interior, Agriculture and Army. Interior Secretary Stewart Udall would be named chairman. This gives Pres Kennedy powerful, operating control over the group. The natural reasources council would be more independent. Although located in the White Houes, it would have only one function: to "think." While many Administration liberals like this latter idea, the President now fears that such a gadfly group might disrupt more than it would benefit him.

(*Continued on page 5*)

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OKONITE CABLE

Dateline . . .

Washington, D. C. (*Continued from page* 3)

Pres Kennedy earlier had miffed many Senate Democrats by rejecting the natural resources unit in favor of more resources planning by the Budget Bureau—perrenial nemesis to some Congressmen, who feel the Bureau's fiscal policies tend to sterilize Congressional directives to the executive departments. Pres Kennedy also said he would set up a resources unit in his Council of Economics Advisors, and this, too, hasn't set well with some liberal Democrats. The Economics Council involves coordination with other federal agencies, and these liberals feel that means delay and compromise.

The water council request—although Senate-inspired—is the Presidents "one more spadeful" on the natural resources group because he will give the water group one function—feasibility revision—which might have gone to the natural resources group. Also, his delay in acting on any related plan, up to now, kept the door open to liberal hopes that the natural resources group might yet be created. Now, they fear that the water council will take off much remaining pressure on him to set up a natural resources unit.

And feasibility revision? The Budget Bureau has been working on it for months and is already behind schedule. Also behind schedule, by at least 45 days, is a special report on revision requested from a group of outside consultants. Now the whole issue will go into limbo, probably, until the water council is approved and staffed.

The water council proposal itself, albeit Congress-inspired, has cause a minor furor in the House of Representatives. The House Interior Committee was given the bill for consideration—partially because Udall feels he has friends there. Now the House Public Works Committee and Chairman Charles Buckley (D-N.Y.) are disturbed because the measure wasn't assigned to his committee.

Letters

What About Miniature Edison Bust?

To the Editor:

I read and thoroughly enjoyed the Edison article in the June 5 issue. It occurred to me that a miniature bust might be made available to commemorate the event. These miniatures would be about 3 or 4 in. high and a replica of the one placed in the Hall of Fame. It would be purchased by the numerous engineers such as myself who received early inspiration from his work.

I would appreciate your suggesting this to the proper people if you agree with this idea.

J. Joberts Britton,
Superintendent, System Operations
Hawaiian Electric Co, Ltd
Honolulu, Hawaii

▶ The idea has been discussed with the Thomas Alva Edison Foundation, Inc, which has considered such suggestions previously There is a question as to how many people in the industry would be interested. Other correspondence on this matter will be noted in this column and passed on to the Edison Foundation.

Vital Equipment Not Mentioned

To the Editor:

On page 74 of the May 29 issue of *Electrical World* you carried a round-up of the equipment used on Arizona Public Service Co's 300-mile, 345-kv transmission line.

Since you covered major components of the line including structures, conductors, insulators, hardware, splices and dead-ends, it seemed rather strange that the 10,000 sets of Preformed armor rods and the 33,000 Preformed spacers for bundled conductor were not included since they are such a vital part of the line and represent a very large expenditure.

L. A. Schweizer, Vice President
Bayless-Kerr Co
Cleveland, Ohio

▶ Thank you for calling this omission to our attention.

Address correspondence to Letters Editor, Electrical World, 330 W 42nd St, New York 36, N. Y.

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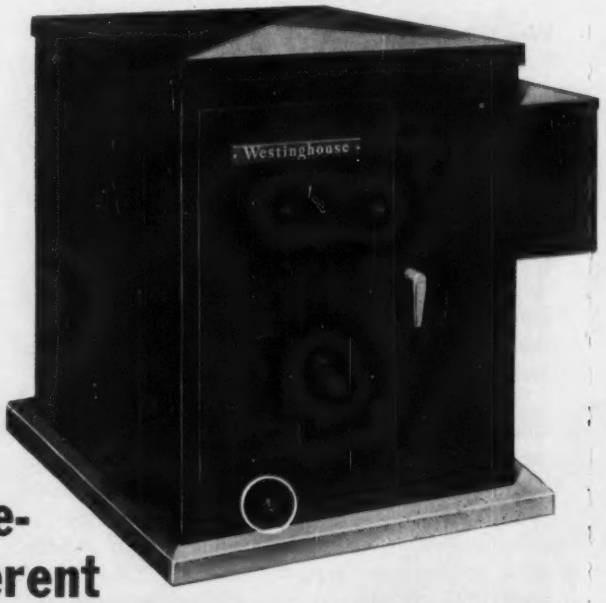
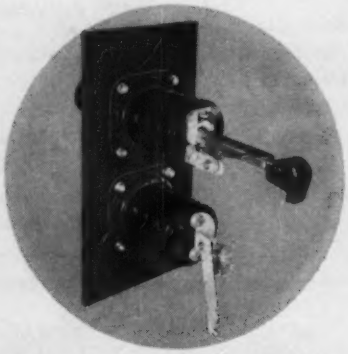
New Westinghouse Pad-Mounted Transformer for Underground Distribution Systems

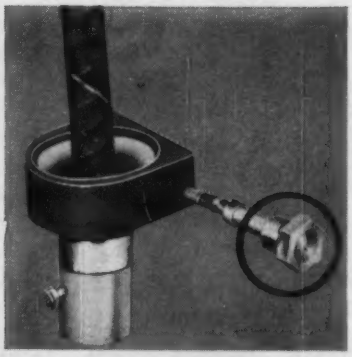


Lack of standardization has hampered the development of residential underground distribution—made such systems difficult and expensive to install. For example, Westinghouse has designed more than 300 different variations of pad-mounted transformers—which is costly both to the user and the manufacturer. After several years' study of customer needs, Westinghouse announces the PSP—a complete transforming-

Westinghouse Primary Service Pad-Mounted Transformer, with optional provision for customer service meters. Main cover can be opened only from inside. Transformer compartment is located directly behind HV and LV terminal compartments. Accommodates 10 through 50 kva transformers interchangeably with same compartments. Detachable cover assembly interlocks with terminal and transformer compartments for maximum security and safety.



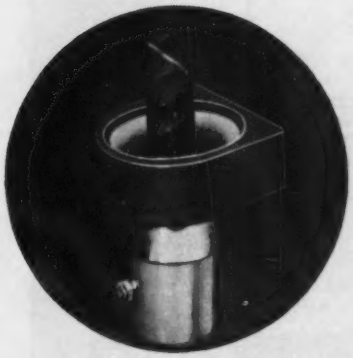
HV load break air switch—a Westinghouse exclusive—isolates transformer. Switch has visible disconnect blade (shown in open position), will safely interrupt 400-amp load current. Interrupter switch and disconnect are mechanically interlocked.



Built-in fault detector is an exclusive optional feature. Magnetic pickup type indicator shows location of fault when cabinet is closed. Note indicator button at base of cabinet in main view above.

J-70869

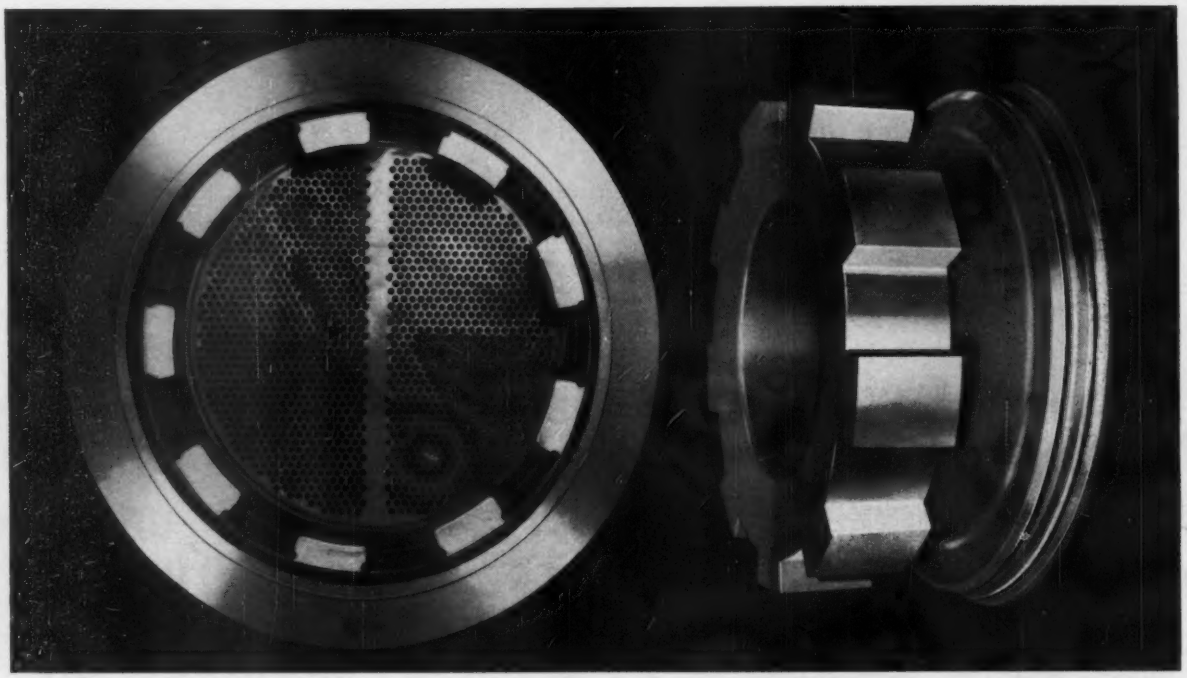
switching-protecting package specifically designed for underground service. The PSP is a Primary Service Pad-Mounted Transformer for residential underground distribution systems—single phase, loop or dual feed, 10 kva to 167 kva with primary voltages up to 15 kv. It is a completely standardized unit, with optional features engineered to meet any special requirements or variations in local practices. Ask your Westinghouse sales representative to show you how the new PSP transformer can simplify your next underground job—from the planning stage to the finished installation. You can be sure . . . if it's Westinghouse.



Exclusive Westinghouse design includes factory-built stress cones, providing convenient termination for shielded cables instead of old-fashioned, laborious hand wrapping.

LV terminal compartment at right encloses optional CSP breaker handle and terminal block for customer service leads. Four-hole spade terminals provide for multi-circuit connections. HV and LV compartments are separated by barrier. LV door can be padlocked. Inside catch releases HV door.

Westinghouse



Simplicity and Easy Maintenance

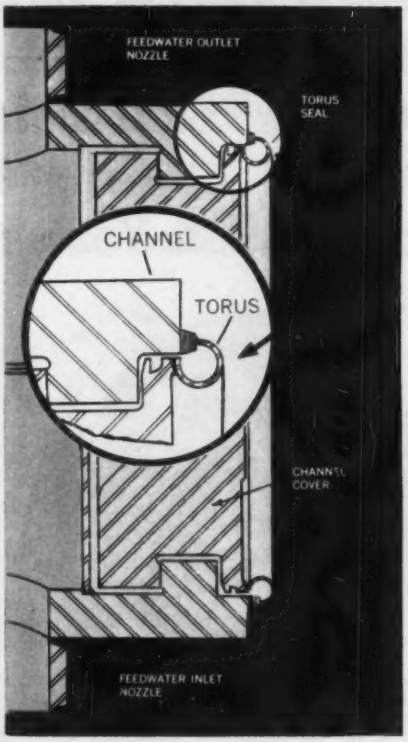
win quick acceptance by Utilities for new FW Feedwater Heater Closure

U.S. utilities had their first look at this new gasketless Breech-Lockhead for feedwater heaters last year. Decisions to buy followed quickly among leading utilities including Pacific Gas and Electric, Omaha Public Power District, Toledo Edison Company, and Gulf States Utilities.

Why such fast acceptance from an industry which must weigh every advance with extreme care? Because the FW Breech-Lockhead closure combines two proven principles—the torus and the breech-lock—the best way yet devised for achieving simplicity and ease of maintenance with a *positive seal*. The torus, welded to the edges of the channel and cover, provides a fully *leakproof seal independent of hydrostatic pressure*.

Disassembly and reassembly of the closure is quick and easy. Since the torus is only a seal it is readily cut away from the channel, and remains attached to the pressure cover. The pressure cover is then quickly removed. Simple tools, supplied with the heater, make cutting, removal, replacement and rewelding a routine procedure.

If you are now considering feedwater heaters, get full technical information on this new Foster Wheeler Breech-Lockhead. It will simplify your maintenance. Foster Wheeler Corporation, 666 Fifth Avenue, New York 19, N.Y.



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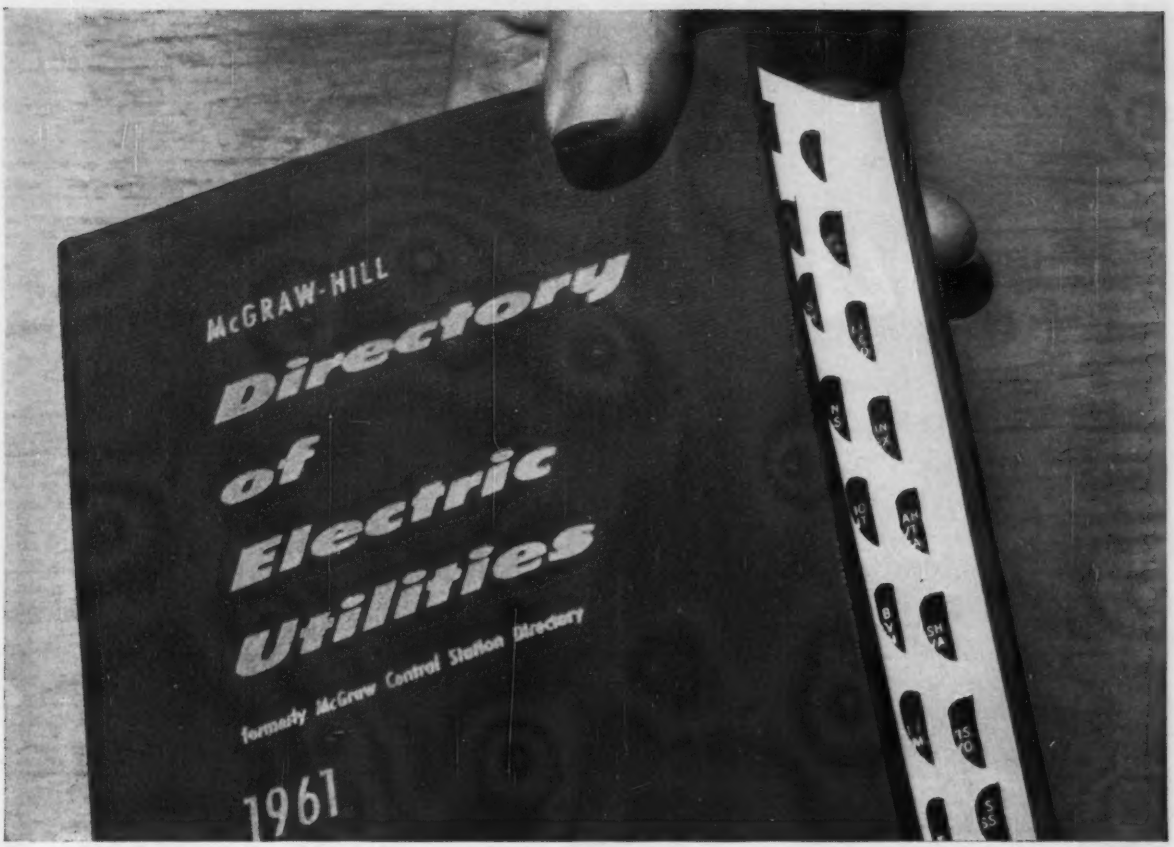

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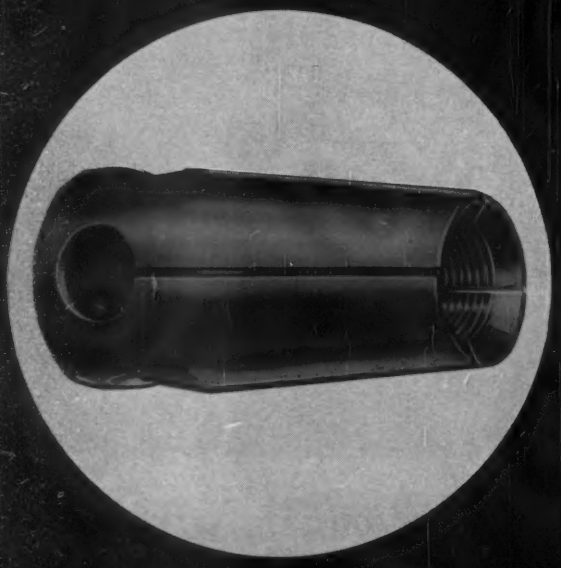

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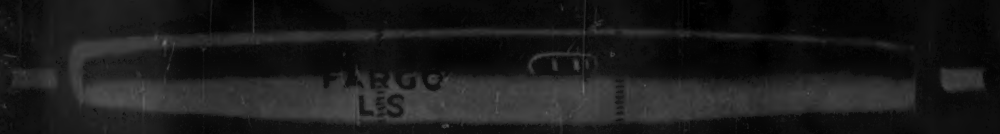

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DON'T MISS 16-page report on small systems.

The Electrical Week

LATE NEWS ▶

Bill to construct power facilities at Hanford reactor is sidetracked in the House, indicating that body will continue fight to block construction. The House previously voted 176 to 140 to strike out the $95-million Hanford power facilities, but the Senate voted 54 to 36 to restore the controversial provision. Latest move in the House came when Republican Leader Charles Halleck (Ind.) objected to the bill being sent immediately to a House-Senate Conference Committee. Instead it will go first to the House Rules Committee which will probably recommend that it be sent to conference.

Federal Power Commission decides to take additional testimony from Washington Public Power Supply System in the Nez Perce-High Mountain Sheep controversy. Hearings will re-open Sept. 12 when WPPSS will present the new analysis of the rival projects which examiner William Levy had barred from the rebuttal arguments. Resumption of hearings this fall will add to the 14,100 pages of testimony already taken, and put off an FPC decision for at least a year.

Pres Kennedy's emergency defense requests to Congress include a $10-million sum for further development of the NEAR (National Emergency Alarm Repeater) system. The NEAR research project transfers Aug. 1 from the Office of Civil and Defense Mobilization to the Defense Dept. OCDM previously had an appropriation of $400,000 for the coming year.

GE trims published prices on 50-kvar capacitors from $104.50 to $97.33 to bring them to current market level. Prices on 100-kvar units reduced similarly.

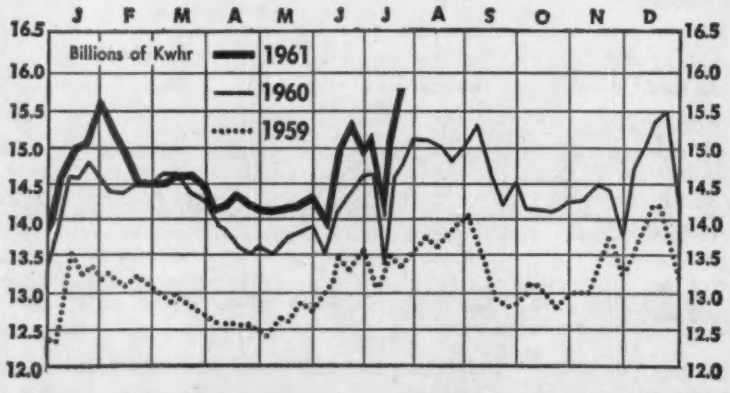
Connecticut's recently enacted 4% tax on gross earnings of both investor-owned and public utilities may be challenged by six municipally-owned utilities in state. Group plans Aug. 9 meeting to decide course of action.

Intense local squall damages steel work at New Orleans Public Service Co's Michoud Station No. 2 Unit (230 Mw) now under construction. No injuries or customer outages occurred, although cost of damage is not yet known. No. 1 Unit was out for three hours, but system interconnections picked up load.

US electric power output hits new high of 15,829,000,000 kwhr for week ending July 22. This is 6.7% over the figure for the same week in 1960. Previous high was 15,641,000,000 kwhr for week ending Jan. 28, 1961.

WEEKLY POWER OUTPUT—Up 6.7%

(Week ending July 22), Kwhr 15,829,000,000



Percent Change From Previous Year

	July 8	July 15	July 22
Total U. S.	+ 5.4	+ 3.2	+ 6.7
New Eng.	+ 5.6	+ 3.9	+ 7.8
Mid. Atlan. ...	+ 6.9	+ 2.4	+11.7
Cent. Indust...	+ 5.7	+ 5.2	+ 5.4
West Cent. ...	+13.3	+ 2.7	+ 5.0
Southeast	+ 2.4	+ 1.4	+ 3.8
South Cent. ..	+ 1.8	— 6.8	+ 9.0
Rocky Mount...	+ 9.6	+ 8.1	+10.6
Pacific			
NW	+ 5.0	+ 4.6	+ 5.5
SW	+ 6.8	+12.7	+ 6.3

Seasonally Adjusted Index 294

Week Ago 287 Year Ago 277

Source: Edison Electric Institute

Supply Lines

UTILITY FLEETS MAKE SUBSTANTIAL PUSH TOWARD MORE MECHANIZATION

Mechanized line construction and maintenance equipment has registered substantial gains in utility fleets during the past year, with such items as aerial lifts, modern digger-derrick combinations, and other line crew equipment making their initial bow in some companies. This is the main observation to come from the Public Utility Fleet Managers' Conference held in Williamsburg, Va., in June. While no over-all survey was made of the actual gains, conversations with a number of those attending bears out the conclusion. Manufacturers of this specialized equipment, who two years ago were scrounging for orders, this year were wrestling with delivery schedules and involved in plant expansion worries. Utility fleet managers, who last year were studying results of test uses of such equipment, this year are hounding manufacturers for faster deliveries. One fleet manager from a large eastern utility reported that he is involved in an extensive fleet modernization program that might be characterized as "revolutionary." Another electric utility fleet manager summed up the situation, "You can say that things are moving and moving fast in our field."

Entry of mechanized equipment will lead to drastic reorganization of line construction and maintenance work forces, forecasts one progressive fleet manager. This may come slowly because of a natural reluctance to change, but it is already beginning to show up. Not far off in the future, line construction crews will be mainly two-man groups. One crew with digger and derrick will go ahead of others. Another crew will plumb and tamp. A third crew will follow with aerial platform for installing insulators and stringing wire. "It will be a matter of fitting the men and the equipment to the job—rather than, as at present, trying to fit the job to the men and machines," asserted the fleet manager.

One immediate symptom of the shift to mechanization is the demand for a four-man truck cab. Nearly half of the fleet managers present indicated interest in such a cab. For some utilities, this would mean that smaller crews would be given more comfort. The smaller crew and the larger cab would eliminate the need for some members to ride in the truck bed.

Current preference for derrick mounting on trucks is another indicator of how utilities are integrating this compact equipment into operations. A show of hands at the conference indicated that nearly 60% of the utilities represented now prefer either a corner-mount or a top-mount derrick which preserves traditional loading spaces, though it may be more inconvenient to operate. With a reorganization of line crews and the addition of other vehicles, some fleet operators believe that back center mounted derricks will become more popular. They argue that this would be a better example of fitting the equipment to the job.

Reliable insulation of aerial working baskets was a hot topic at the conference, figuring in many of the corridor conversations. One or two of the manufacturers held that a heavy Fiberglas basket and a complete Fiberglas upper boom should provide the insulation needed for distribution work. But the more vocal manufacturers and fleet managers argued loudly for polyethylene basket liners that could be frequently tested for insulation properties. Several fleet managers characterized the liners "as the cheapest insurance you can buy." One manager urged regular testing of these liners by utilities on the same basis and on a schedule similar to that used for rubber gloves and rubber blankets.

Though only two manufacturers claim dielectric testing on each of their aerial baskets, all others have sample testing and spot checks. One manufacturer will

test dielectric strength of aerial basket on request. Most who furnish basket liners conduct immersion tests and will supply test results to buyers. The main reason that all manufacturers do not test every basket is a lack of high-voltage test facilities, but all have access to such facilities. One manufacturer probably spoke for several others when he said, "We believe that most electric utilities will want to conduct their own tests under conditions they deem feasible."

Provision for safety belt attachments in aerial baskets is made by most manufacturers. This was brought out after one fleet manager reported that use of a safety belt has prevented one lineman from being thrown from a basket in a recent incident.

The wide selection of mechanized line equipment on display and under discussion at the Williamsburg conference brought general commendation from the utility fleet men. In summarizing developments over the past few years, one fleet manager praised manufacturers for devoting increasing attention to the dielectric characteristics of their equipment and for adding safety features of all kinds. He noted particularly the innovation of platform mounted seats for derrick operators and indicated that this would give operators a better view of their work and greater safety from the possibility of electric shock. He also praised improvement in the servicing of such equipment.

Caution on the use of barehanded, live-line techniques came from two sources. A spokesman for a manufacturer which has pioneered in this technique for transmission line maintenance cautioned against its use until full instruction and training can be provided. One of the utility members asserted that barehanded techniques used on transmission lines are not adaptable to distribution lines, mainly because of spacing and configuration of lines.

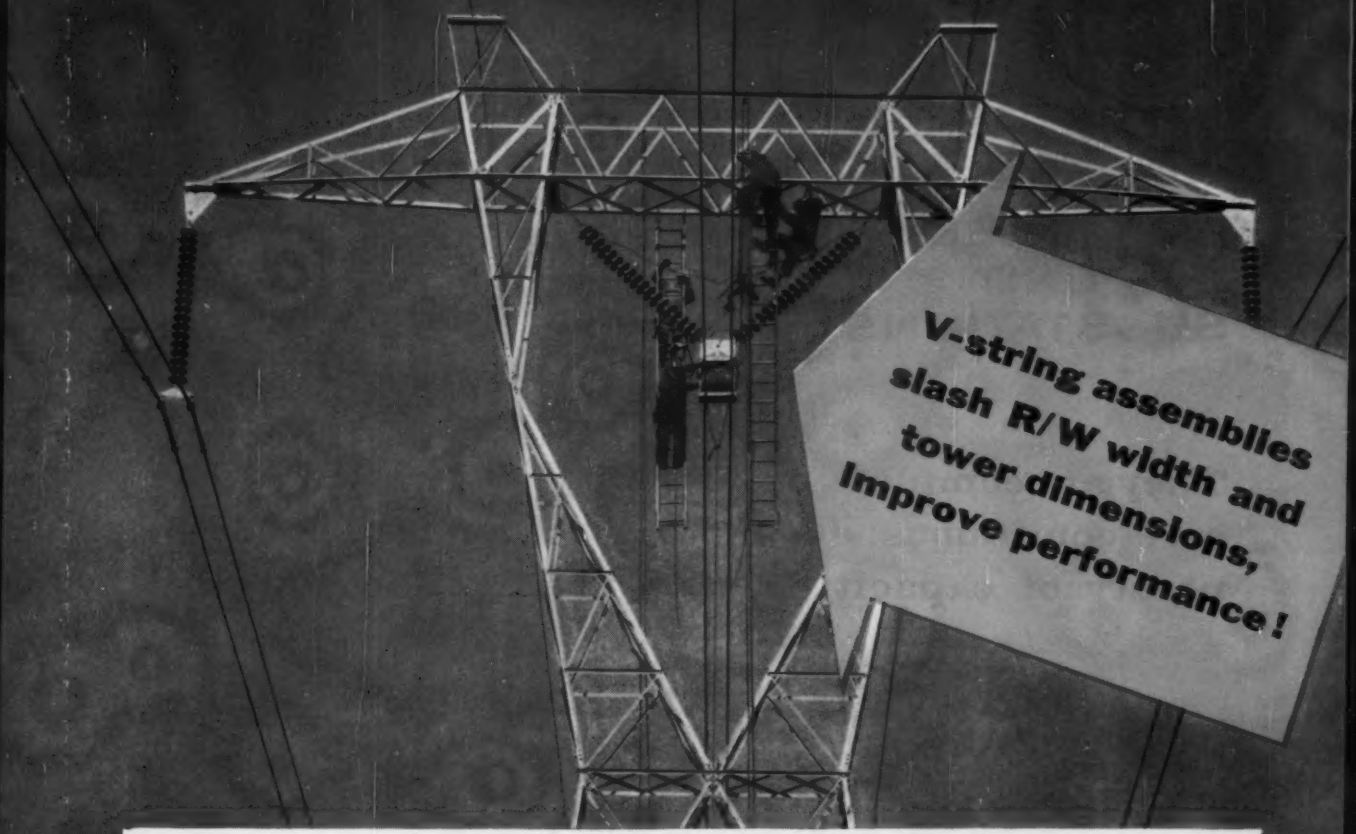
Future role of compact cars in utility automotive fleets appeared unclear—due mainly to uncertainty of future car styling. Spokesmen for most leading car manufacturers were not able to say whether their plans called for larger compact cars or smaller standard cars. It was indicated this would depend entirely on customer preference in the market. The manufacturers appeared to question whether the impressive gains racked up by compacts in fleet operations was a solid trend—or just a protest against the expanded dimensions of recent standard models. While preliminary figures furnished by manufacturers and utilities indicated substantial savings resulting from purchase and operation of compacts, utility fleet men cautioned against too much reliance on available figures. The big question mark is on depreciation of compacts. They have not been on the market long enough to fully test trade-in values. A pertinent observation came from a utility fleet manager: "If the manufacturers decide to go to smaller standard cars, then the present compacts might very well become 'duds' on the used car market."

American-made van-type light trucks are making an entry into utility fleets and initial reaction is favorable. They are being used as appliance service vehicles, mail delivery vehicles, and for other relatively light tasks.

MANUFACTURERS WILL PRICE 65C TRANSFORMERS COMPETITIVELY

After General Electric announced two weeks ago that it would reduce prices as much as 10% on 65C transformers, *Electrical World* queried other manufacturers about their plans for the new transformers. All of the nine who replied said their prices would be competitive—and most indicate they will have the product or have it already. A full report on their reactions will be carried next week.

We'll show you proof of savings!



Conductor side-sway is an important factor in the design of high-voltage transmission lines.

On a conventional 230-kv line with free-swinging suspension strings, conductor sway at the structure necessitates an additional 35 feet of width in the right of way, an additional 10 feet of crossarm width, and an additional 10 feet of structure height. These requirements are correspondingly higher at higher voltages.

If conductors are restrained by V-strings, significant savings can be achieved in right of way, structures, and maintenance - - and electrical performance of the line can also be improved.

If you'd like more detailed information, send for O-B publication number 1503-H, "High Voltage Line Economies With V-string Insulators."

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10094-H

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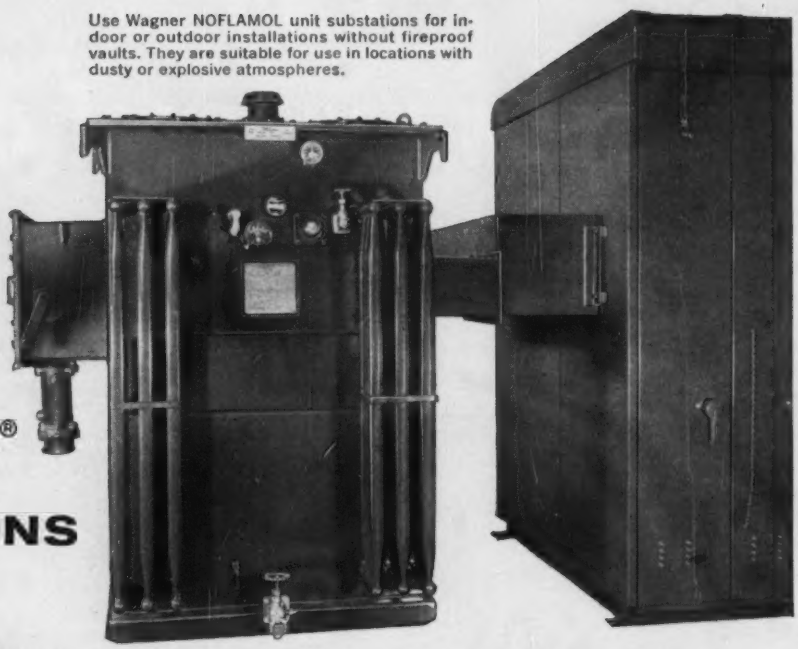


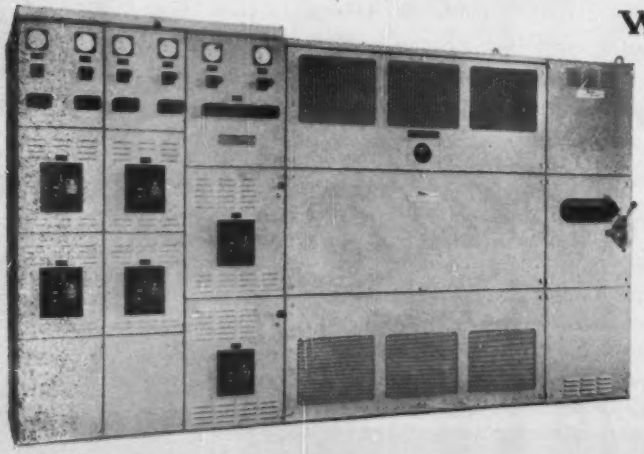
They are complete, coordinated load centers that give continuous, dependable power now... have plenty of capacity and flexibility for growth

An uninterrupted flow of power... that's the important thing in buildings, be they sprawling single-story factories or high-rise offices. And that is what Wagner® unit substations provide.

Designed to improve voltage regulation, and built to be troublefree, they are coordinated load centers that provide the flexibility needed to meet future load requirements. They consist of a proved Wagner transformer, universally acceptable interrupting devices, highly reliable air break switchgear, and metering equipment combined in perfect power packages. To simplify installation, they are factory tested and shipped completely assembled, ready for service. They economically deliver utilization voltage with shorter, less expensive conductor runs... lower maintenance costs with modern, protective enclosures... safeguard valuable equipment with adequate interrupting capacity. And, substation investment is protected because *one* manufacturer has responsibility for all component parts.

Wagner unit substations are built with transformers rated 112½ through 2000 kva, 3-phase, 60 cycle ratings with high voltages of 2400, 4160, 4800, 6900, 7200, 12000, 13200, or 13800 volts and low voltages of 240, 208Y/120, 480 or 480Y/277 volts.

Four types per NEMA standards are available: sealed dry-type; ventilated dry-type; oil-filled; and Noflamol (non-inflammable liquid-filled).



Wagner Electric Corporation

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will be glad to help you plan any power distribution system. Get complete information on Wagner unit substations from him, or write us for Bulletin TU-152.

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WT61-8A

Blackburn Laboratories Develop New, Improved contax®

(Oxide-inhibiting compound)

HARMLESS TO LINEMEN'S GLOVES AND IMPROVES CONNECTION PERFORMANCE

Extensive laboratory tests by Blackburn, confirmed by an independent manufacturer of rubber goods, prove conclusively that BLACKBURN'S Contax has no adverse effect on linemen's rubber gloves and blankets.

In addition, Contax gives improved connection performance. It penetrates the oxides on conductors to reduce connection resistance. It inhibits oxidation and galvanic corrosion by sealing out moisture and air from the connection surfaces.

Contax comes in crack-proof, see-through, plastic squeeze bottles. It's a non-petroleum, synthetic polymer grease with suspended zinc particles . . . has an extremely low moisture absorption rate, and is usable over a wide temperature range. Contax is non-toxic and flame resistant . . . will not harm the skin.

For detailed test data, send for Data Folder #6009.

Jasper BLACKBURN Corporation

1525 Woodson Road **St. Louis 14, Missouri**

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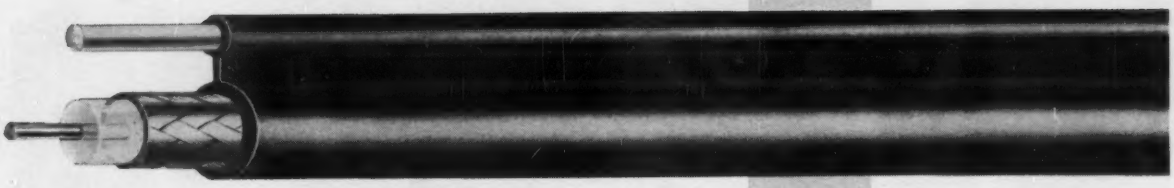

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Eliminates the need for separate messenger—speeds installation! The overall jacket is high molecular weight polyethylene. SUPERIOR I.M. (Integrated Messenger) Coaxial Distribution Cable provides maximum efficiency and economy for use with Community TV, Educational TV, Closed Circuit Industrial TV, Closed Circuit Entertainment Systems, and other high frequency applications.

For more information, write

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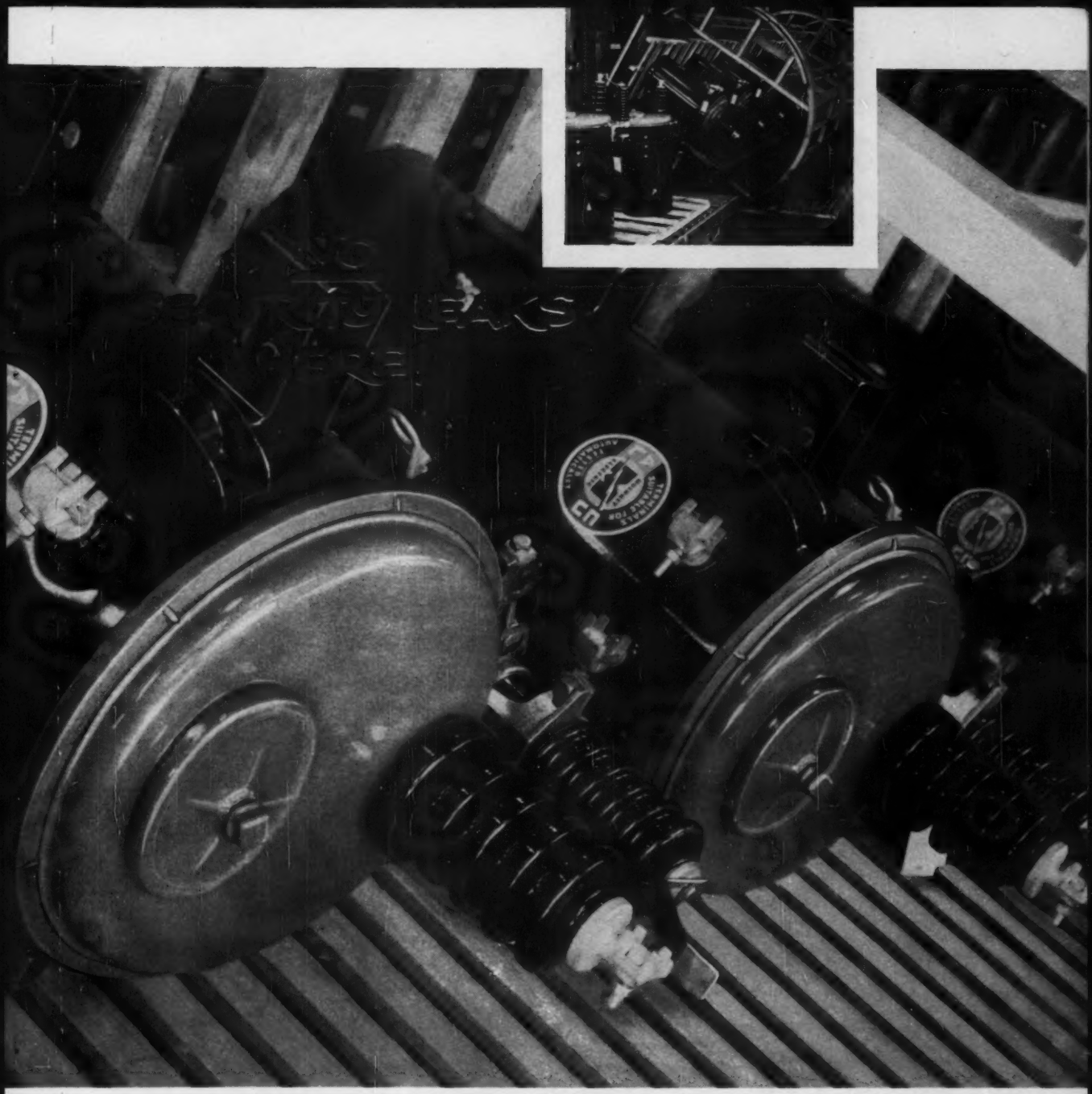

In the interest of security we literally turn things upside down looking for leaks.

Yes, Moloney Distribution Transformers are actually turned upside down during our Inversion Test. They must pass this security test which detects any leaks due to faulty seal.

When you purchase Moloney Distribution Transformers, you can feel secure from outages and frequent maintenance problems caused by moisture and sludging . . . two very subversive elements.

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Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

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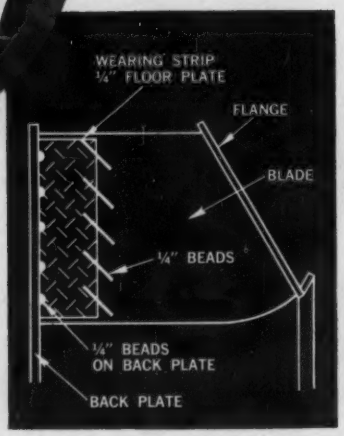

Designed for the most rugged induced draft applications, 'Buffalo' Type "H" Fans withstand continuous abrasive wear at the highest static efficiency ever obtained with this type fan. ■ Radial tip blades curve smoothly forward at the heel to meet incoming air at the optimum angle. A modified flange design produces streamlined flow of air from wheel entrance to tips of the blades. Welded wear strips (¼" steel floor plate) break up particle flow and prevent dust particles from gouging or scouring the blades. ■ Particle buildup is eliminated... housing wear is negligible... turbulence is minimized. In addition, static pressure and capacity are increased... maintenance costs and sound levels lowered. ■ 'Buffalo' Type "H" Fans are available in 15 sizes and a variety of widths for various capacity/pressure requirements. ■ For all the facts, call the resident Buffalo representative nearest you. Or write our home office direct.

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Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

21 Years Underground

—and still as good as new!

21 years ago, the **Niagara Mohawk Power Company** specified Burndy MOLEs for their underground modernization program. Specifications called for a connector that would perform without fault, under prolonged exposure to dampness, oils, extreme temperatures, and last the life of the cables connected. The MOLEs met all specifications, and are as good as new today ... proof beyond doubt that Burndy MOLEs have the high quality necessary for underground systems.

Utilities thruout the country have had similar long years of trouble-free experience with the MOLE ... experience that proves that the MOLE meets underground specifications for maximum dependability.

If you are considering "going underground", or expanding your present system don't take a chance on costly burnouts and disrupted service, call your local Burndy representative ... he has had years of underground experience and can help you get maximum dependability and flexibility in your underground system.

Photo from Niagara Mohawk Power's file, dated 1938, showing actual installation of MOLE in its underground system. These same MOLEs are in operation today, after 21 years of trouble-free performance.

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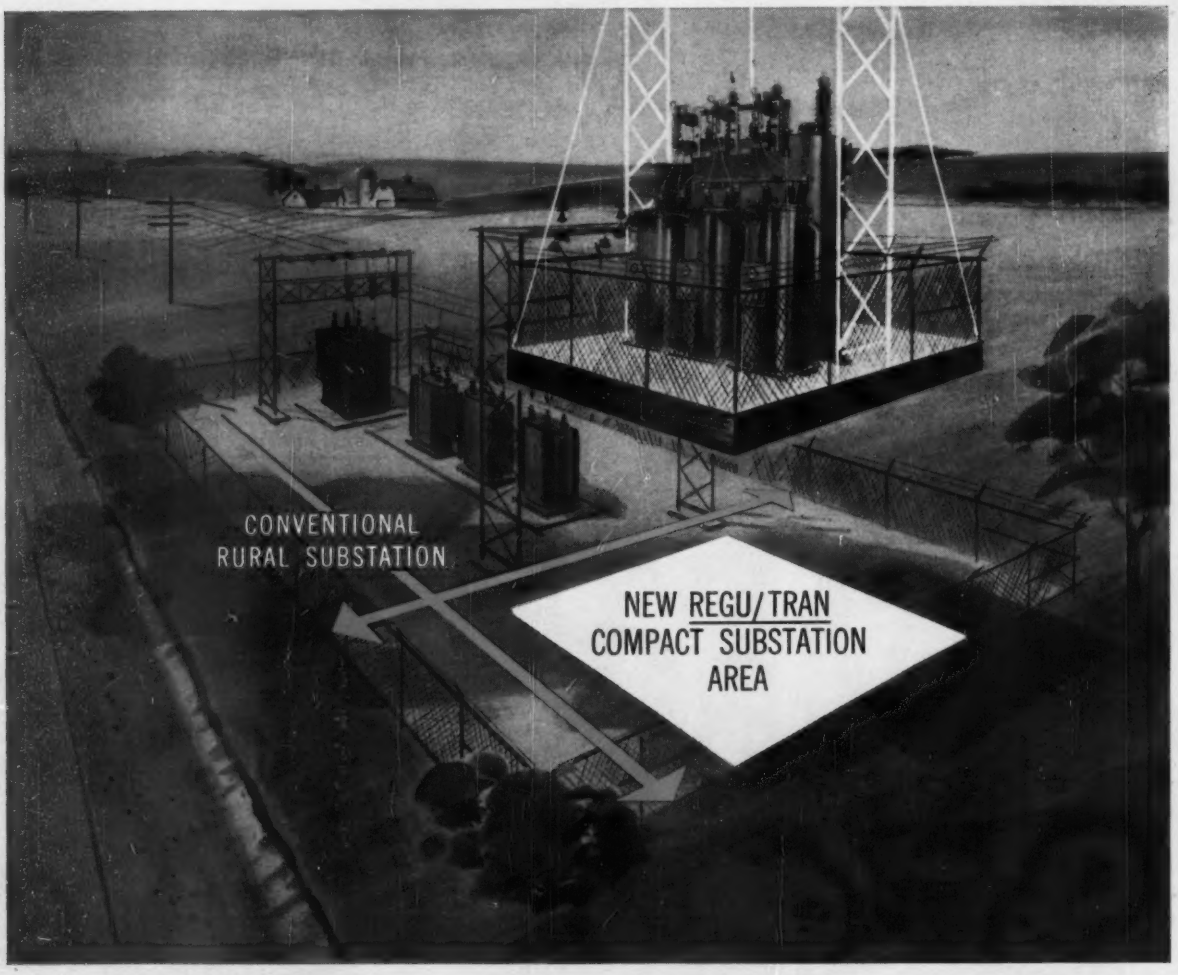

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A complete, compact substation package from Allis-Chalmers!

You get guaranteed performance and the economy of a standardized item. *Regu/Tran* compact substation requires only 25% of the area needed by conventional rural substations.

More savings! Buy the entire package on just one purchase order. Shipments are dovetailed to your construction schedule. All parts are keyed to master drawings.

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Heart of the substation is the *Regu/Tran* unit. This new concept provides single-phase regulation with provision for safe by-passing of regulating equipment without dropping the load. A-1442

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Regu/Tran compact substation vs conventional

1. Just 1 mounting pad instead of 3	**2.** 4 piers instead of 6	**3.** 13'9" x 22' compared to 24'x62'
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7. Less interior gravel or rock surfacing	**8.** Preassembled main structures cut erection time	**9.** Regu/Tran unit can be replaced with larger unit later without changing structure

Ask your nearby A-C office for Bulletin 61B9756 or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.*

PSC Directive Sparks New System Concepts

Many citizens of the Metropolitan Area probably construe the New York Public Service Commission's recent directive to Consolidated Edison Co as an official reprimand. After all, 119,000 electric customers were inconvenienced by Con Edison's latest outage (EW, June 19, p 48). But utility engineers may see in it the deeper significance of governmental intrusion into management's right to plan the system.

A careful reading of the Commission's engineering report (p 24) reveals little outright criticism. The PSC has not made the utility the scapegoat in its investigation of the June 13 outage. But it did attribute the outage to Con Edison's policy of designing subtransmission to network area substations on a first contingency basis. The report concedes that this policy is common among utilities, but asserts that it is not adequate for a city as dependent upon continuous electric service as New York.

Obviously the Commission gave weight to Con Edison's role as a long-time pioneer in giving the world's largest city electric service with a reliability beyond the reach of most utilities. Its development of the low-voltage network, for instance, dates back to the early Twenties. Its objective then and since has been provision of ac service to match in reliability that of the heavy dc grids, backed up by enormous storage batteries, they replaced.

For Con Edison introduced area ac networks. The early ones were served at bus voltage from five generating stations and designed to ride through the loss of any one feeder. Growing loads soon compelled the utility to add more feeders. Recognizing that widening exposure increased the probability of simultaneous feeder outages, the company long ago adopted the multiple-contingency concept of area network design.

In all these developments, Con Edison set the pattern for the nearly 300 low-voltage networks here and abroad. Most of the latter started as first-contingency designs. And many have given good service for years, even though they still adhere to the first contingency design. They performed thus despite the probability that a second contingency at peak load could overtax their residual capability.

But mounting load in each network area reached the point where Con Edison's ability to pick it up, requiring simultaneous closure of numerous feeders, became doubtful. Thereupon the company pioneered the subdivision of network areas, and began to build large network supply substations squeezed onto costly real estate in the network areas.

These substations were large enough to be supplied by 69-kv pipe cables from outlying bulk-power substations. Drawing upon its network know-how, and capitalizing upon the probable reliability of the pipe cable, Con Edison served these new stations in somewhat the same way it serves large spot networks. It used four or more 69-kv feeders to individual transformers switched on the 13-kv side with relaying that gave characteristics somewhat similar to that used in low-voltage network protectors. Understandably, Con Edison adopted a single-contingency philosophy for the few 69-kv circuits in these supply systems.

The PSC directive implies that Con Edison's network pioneering is not over. With this, the utility tacitly agrees, at least in principle. And we are sure that other companies across the nation will be watching developments with interest, as New York once again becomes a proving ground in this area.

Yet we are concerned lest the pinpointing of the solution by the Commission report give heart to those who would be glad to have governmental bodies participate actively in utility system design. Constant vigilance must be maintained to retain this as management prerogative.

Con Ed to Meet PSC Demands

Con Edison said it has informed the New York Public Service Commission that it will comply with the recommendations embodied in a Commission report and order on the June 13 power failure.

The utility company has been directed by the New York Public Service Commission to change the design of bulk substations supplying high load density network areas. The purpose of the order is so the loss of two substation transformers or their supply circuits at one time will not result in interruption of service from the related networks.

In short, the company was told to apply the second contingency concept it now uses in its low-voltage networks and their feeders to network bulk supply systems.

Detailed plans for carrying out the recommendations concerning the design of bulk power substations in high density load areas will be submitted to the Commission as soon as they can be completed. The work necessarily will entail the expenditure of millions of dollars and miles of street excavations, the company said.

The PSC's directive is the result of an investigation into a 4½-hr outage June 13 affecting a large portion of midtown Manhattan. It has been determined that the outage was caused by failure of Micarta insulation in bushings on two 13.8-kv, 1,000-Mva, 3,000-amp, Westinghouse circuit breakers. Four low-voltage networks were knocked out of service.

A report written by H. L. Colbeth, principal electrical engineer of the PSC, and approved by the PSC, states:

"While the networks themselves are planned on a second contingency basis . . . the bulk substations, and the 69-kv circuits supplying them, historically have been planned on a single contingency basis. This means that a substation will continue to supply its satellite networks if one substation transformer, or one of the 69-kv circuits feeding it, is out of service.

"In the utility industry generally, this engineering concept has been considered acceptable heretofore because it is most uncommon for two elements of a high-voltage system to fail almost simultaneously resulting in insufficient time to repair one before the other fails. One of the reasons why high-voltage circuits are considered more reliable is that they run directly from one substation to another and are not exposed to mechanical and electrical damage as are the 13.8-kv network feeders with their wide geographic coverage and their many taps and connections.

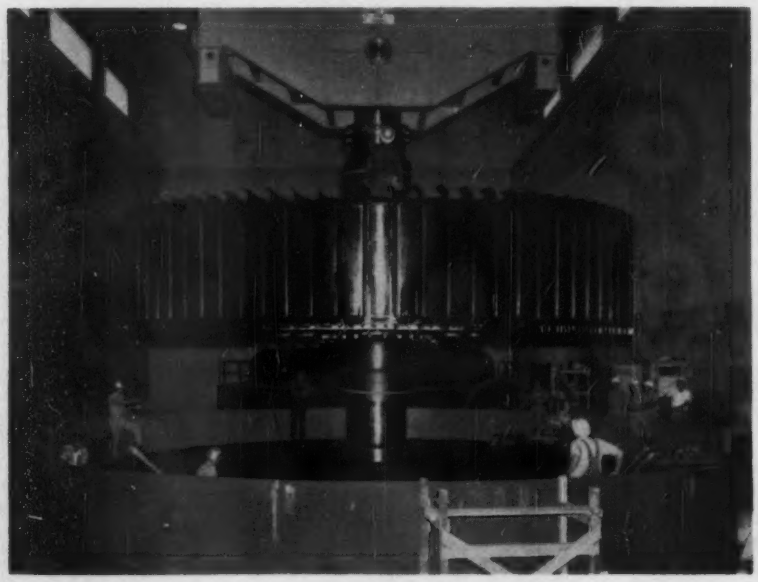
"No electrical system, no matter how costly, can be guaranteed to be entirely free from interruptions. Consequently, utility companies have not attempted to provide complete duplication of their high-voltage systems. Even if every item were to be duplicated, with spare facilities standing by idle for possible emergency use, there could be no complete assurance that interruptions would not occur.

"With the knowledge that duplication of a system would add many millions of dollars to the rate base, imposing greatly increased costs on the rate-payers, utilities have designed their high-voltage systems on the single contingency basis. The general experience with such systems has been favorable."

Colbeth's report concludes:

"The cost of installation of a two-contingency high-voltage system is quite high. For this reason and also because the particular problem which caused the June 13 interruption in New York City was thought to be relatively remote, it was felt in the past that the potential dual failure of network supply substations would not be economically practicable. However, experience has shown that the potential dual failure of network supply substations is a distinct reality. Therefore, at this time, it is appropriate to reconsider the designs which have served so well in the past."

Colbeth then recommends that the second contingency concept for



Million-Lb Rotor Installed

Crew lowers a one-million-lb rotor into place in the powerhouse of Ice Harbor Dam on the Snake River near Pasco, Wash. Initial power production is expected from the $135-million Corps of Engineers project by the end of 1961. The dam's initial capacity will be 270 Mw with three generating units.

Con Edison's high density load areas be made a requirement.

In public discussions immediately after the power failure, it was established by the PSC staff that Con Edison has done much in recent years to rebuild its system so failures would affect only small areas. The number of networks has been increased so that a smaller area is covered by each. However, the PSC report pointed to the June 13 interruption as showing that "the desired degree of reliability has not been achieved."

It had been urged in public discussions that high-voltage feeders which are unidirectional, or those which serve more than one substation and are termed "bi-furcated," should be eliminated. Colbeth agreed that this would be an improvement in some cases, although an expensive one. "Feeder configuration," he said, "is only one of the details of a high-voltage supply system. The design concept must be judged as a whole as well as in its separate details."

New Bushings Are Supplied

In the meantime, Westinghouse has supplied new bushings with Thermolastic insulation to replace Micarta bushings on all 12 3,000-amp circuit breakers at Con Edison's 65th St substation and on all six 3,000-amp breakers at Granite Hill substation.

Manufacturer's tests, witnessed by a PSC engineer, showed that in both defective breakers the insulation in an upper bushing had failed approximately at the mid-point of the bushing. "An incipient fault at this point could not have been found by any practicable inspection procedures," the PSC report stated.

"Analysis of the results of the manufacturer's tests showed that the faults were due to a defect in the design and application of the Micarta insulating material of the bushings. This same material has performed well in breakers of lower ratings but does not appear to be suitable for use in 3,000-amp breakers when subjected to high operating temperatures."

The Thermolastic material used in the new bushings, proved under test to be greatly superior to the Micarta insulation and adequate for the duty expected of it, it was stated.

Experience Issue Not Likely To Affect FPC Nominations

White House aides scanning names of possible appointees to the Federal Power Commission seem to be unimpressed by the argument that the big turnover in members recently calls for the appointment of someone with direct experience with the FPC.

Thus, the White House may have written off commissioner Arthur Kline and former commissioner William R. Connole as possible successors to Frederick Stueck, who died recently. Furthermore, there is little feeling that there is any need to prevail on Chairman Jerome K. Kuykendall to remain on the FPC until his term expires next June.

Stueck's death and Kuykendall's statement that he intends to leave the FPC shortly after he steps down as chairman on Sept. 1, mean that Pres Kennedy must find either a Republican or an independent to fill these two vacancies.

No more than three members may be of the same party, and Pres Kennedy's first three appointees, Joseph C. Swidler, Howard Morgan and Lawrence J. O'Connor Jr, are all Democrats. Kline's term expired last month, but he is serving until the Senate confirms O'Connor to succeed him.

The changes in membership will mean a complete turnover in the five-member agency in about 18 months, and this has caused some alarm at the FPC over the possibility of a lack of continuity in operations.

Swidler, who will take over the chairmanship from Kuykendall, won't discuss the continuity question, and says it's a problem for the White House.

There, a long list of possibilities has been compiled without any of the names being bandied about at the Commission. No decision on Stueck's successor has been made, however. Connole isn't being considered because the White House has taken him at his word that he wouldn't return to the FPC unless he could be chairman.

White House aides promise that the appointee will be experienced in public utility regulation, but they downgrade the idea that any first-hand Federal Power Commission experience is needed.

Tax Credit Bill Would Exclude Utilities

Legislation that grants credits against taxes of 8% of investment expenditures has been tentatively adopted by the House Ways and Means Committee. Although the measure was somewhat modified from what had been proposed by Pres Kennedy, most public utilities would be excepted from relief granted to other industries.

The committee, however, would grant tax relief to pipelines for delivery of natural gas.

An 8% credit allowance on new production facilities is estimated by Treasury officials and committee members to cause a loss of $1.1 billion to $1.25 billion in revenues. This would amount to another $300 million if utilities were included, but if the credit were dropped to 6% utilities could be included with no more loss of revenue.

Both Treasury officials and a majority of the committee are insisting that the revenue loss be made up with tax increases elsewhere. Proposals for this so far are tightening expense account regulations, imposing withholding taxes on interest and dividends, and tax fire and casualty companies and foreign income.

Administration officials gave two reasons for excluding utilities from the tax credit plan: (1) It would mean additional loss of revenue; (2) Utility expansion is geared to demand and would not respond to tax incentive. The latter argument was sharply disputed in a statement by Philip Sporn, president, American Electric Power Co.

Two Utilities Test Race Rules

Negotiations between Houston Lighting & Power and Navy continue as race question comes up in President's group

Two electric utilities are providing the President's Committee on Equal Employment Opportunity with the first test cases on how the government's anti-discrimination rules apply in their industry. The cases grew out of the Kennedy Administration's efforts to put the federal anti-discrimination clause in contracts involving two southern utility firms.

As the rules now stand, utility companies are covered by the White House order that bars discrimination against negroes and other minority groups in work on government contracts over $10,000. However, the rules also permit special exemptions from the order—if the President's committee approves.

Committee Studies Cases

Last week, the committee, headed by Vice President Lyndon Johnson with Labor Secretary Arthur Goldberg as vice chairman, took up these cases for review:

- Refusal by the Houston Lighting & Power Co to sign a Navy contract to provide power for Pelican Island destroyer base at Galveston, Tex. The company rejected a request by the Navy to sign a contract that included the anti-discrimination clause.
- The Carolina Power & Light Co has appealed to the committee for a special exemption from the anti-discrimination order in contracts to supply power to Army and Air Force bases in North Carolina.

The challenges to the federal anti-discrimination program came within a week of the committee's publication of its rules and regulations on how the anti-discrimination program will work. Under the rules, all contractors and subcontractors with the government are required to file reports indicating there is no discrimination in their federal contract work.

In addition, such contractors—at the committee's request—must file statements that labor unions they deal with have no discrimination in their membership rolls. The final penalty for a noncomplying contractor is cancellation of the federal contract. Though the government has no legal authority over labor unions—which are not signatories to the contracts—it may call in union officials to public hearings if they refuse to eliminate bias in membership.

Committee officials emphasize they will seek compliance from federal contractors by voluntary means. In addition they may grant special exemptions to groups of employees. Among those on the exemption list are contractors who supply "standard commercial supplies and raw materials." However, a committee spokesman said this general exemption does not include utility companies—this would have to come by a special committee ruling.

In response to an inquiry from *Electrical World* as to plans with regard to an attitude toward the Presidential order calling for integration in firms having federal contracts, Virginia Electric & Power Co said that "the company will comply with the Presidential order and its rules" as best VEPCO understands them. The company has already signed one contract which incorporated provisions of the order since the order was issued. VEPCO signed contracts with similar provisions before the Presidential order was issued.

Based on discussions with electric utility people in the Southeast, several factors appear to be involved in the President's order. From the viewpoint of electric utilities the order appears to center on contracts for service to military bases.

Some utilities in the Southeast:

1. Feel that they should not be required to impose provisions of the order on all suppliers and subcontractors.

2. Think that if they do attempt to do that they may have to maintain a large police force to meet the requirements of the Presidential order.

3. Think the order involves undue bookkeeping and expense that could become burdensome.

4. Wonder what position they will be in if the low bidder on equipment does not comply with the Presidential order. Will they be in the position of not being able to buy from the low bidder under terms of the government contracts and the Presidential order, and if so what will be the attitude of state commissions with regard to the added cost to rate payers?

5. If a company signs a contract including provisions of the Presidential order, will this be taken by the company's customers as a move by the utility to take the lead in integration? If it is, what will be the effect on the public relations of a company operating in a territory where public opinion predominantly favors segregation? These companies will not be able to offset adverse effects with "votes" from integrated states.

6. When Houston L&P refused to sign its contract which included provisions of the Presidential order, the Navy supplied power from destroyers at the base, though HL&P offered to continue service on a month-to-month basis. What steps will be taken on inland bases? Will this be used as an excuse to build government power plants or transmission lines or both?

Utility companies in the Southeast are analyzing their own situations to see what can or should be done.

Atomic Research Called Vital to Gas Industry

Atomic energy will soon be used to transfer coal into gas, predicted R. E. Ginna, chairman of Rochester Gas & Electric Corp, in defense of RG&E's policy of charging 40% of its atomic research to its gas department.

Ginna said that atomic research would, in the foreseeable future, show methods of converting coal into gas at costs competitive with natural gas. This atomic process will be essential to assure future gas supply, he said.

Public Power Supports Regional Tie Study

Both the American Public Power Assn and the National Rural Electric Cooperative Assn are supporting an Interior Department request for $300,000 to initiate a study of regional transmission interties. The Department expects to ask for another $300,000 next year to continue the study.

The study would cover the Bonneville-California intertie, possible ties between Bonneville and the Missouri Basin and between Southwestern Power Administration and the Missouri Basin.

Testimony supporting funds for the study was recently made public by the Public Works Subcommittee of the House Appropriations Committee. There was no opposition voiced to the request.

Reclamation Commissioner Floyd Dominy, queried on whether the new study would duplicate the present Interior Department task force study of the Bonneville-California intertie, said earlier reports by Bonneville "of the possible intertie to the Southwest Pacific area did not take into account the additional power made available through the Canadian treaty. Neither did the state (California) report (prepared by H. Zinder & Associates). That must be looked at now."

Dominy told the subcommittee, "These proposed interties in the minds of many people—and this is something we would like to run down through some detailed investigations—visualize not only the interconnections that would tie the two federal systems (Army Corps of Engineers and Reclamation Bureau) together, but visualize ties for the whole industry."

APPA General Manager Alex Radin told the subcommittee, "This is one of the most important items in the Interior Department's requests, indicating a recognition of the need for a thorough analysis of possible benefits from such government-owned inter-regional transmission interties."

Later in supporting an all-federal transmission system for the Upper Colorado River storage area, Radin wrote that such a system for the area "would represent a vital link in a high-capacity common carrier grid extending throughout the West. Such a grid would provide mutual benefits for all regions and all utilities—public and private."

Charles Robinson, testifying for NRECA, asked that the request for $300,000 be doubled and the $40,000 being used for studies of the Bonneville-California intertie also be doubled. He said, "The investor-owned utilities in the Southwest are in process of building 4,000 miles of high-voltage tieline at a cost to them of $300 million to tie all the way from the Gulf of Mexico to Omaha. The line programed by the utility companies will go through the heart of the SPA area and unless SPA is permitted to proceed with an interconnection scheme of its own, it will be in a disadvantageous competitive situation."

Senate Committee Considers Fund Requests

The Senate Appropriations Committee continues to hold back its public hearing on the Upper Colorado Project transmission lines until the House Appropriations Committee reports out its bill for fiscal 1962 public works funds.

But time is pressing in, and the Senate committee has gone ahead with hearings on all other fund requests by the Bureau of Reclamation, Southwestern, Southeastern and Bonneville Power Administrations. Earlier, the Senate group planned to hold off all hearings on Reclamation and the power agencies until the whole House approved its appropriations bill.

No change in testimony has been given to the Senate committee, but some comments are interesting:

• The Bonneville Power administrator expects the Canadian government to ratify the Columbia River Treaty this fall, probably during a session of Parliament which begins Aug. 1. He also said he plans to report to the Senate Interior Committee by January on a draft bill to "protect" the Pacific Northwest from power shortages, in the event a major intertie is built from the region to California or elsewhere. The present draft still is being circulated by Bonneville to its customers.

• Southwestern Power Administrator Douglas Wright praised the electric utilities in his area, pointing out that 16 of 20 companies serving co-ops in SWPA territory do so at lower rates than SWPA does.

Wants Bridge Canyon Money

• Reclamation Commissioner Floyd Dominy repeated his request for $65,000 for the Bureau to study possible federal construction of the Bridge Canyon project, on the Colorado River, Ariz. Dominy also urged the committee to study the differences in opinion, between the Bureau and the Corps of Engineers, on what priorities should be given different water uses in the Missouri River Basin. Dominy feels power rates priority; the Corps claims it has no priority over navigation.

Questions Power Arguments

• Sen Henry Dworshak (R-Ida.) raised the question of why strong public-investor-owned power fights break out frequently in the Northwest, while the Missouri Basin and some other areas seem to be relatively immune. He described the "terrific struggle" over "a few steelhead or bluebacks" (migratory salmon), and over "some extensions of federal power lines" in the Northwest. Dominy suggested the differences were due to "differing company attitudes" and "differences in personalities and company attitudes." Dominy added he could see no reason for objections to building federal lines in the Upper Colorado project area.

Part 1

The 'All-Gas Package'—How Serious

Electric utilities, particularly in areas with low-cost natural gas, are gearing for a major sales fight against installations of small gas turbine-generators by industrial and large commercial type customers.

The concept of self-owned and operated electrical generation is currently being pushed extremely hard by the natural gas industry, and reports from electric utilities to *Electrical World* indicate that the push is regarded as a major competitive threat. There is also underlying hope, and some quite firm belief, that the installations will prove to be too impractical, and that this will cause the approach to die of natural causes.

In the meantime, however, most electric utilities contacted by *Electrical World* reporters recognize that there is a certain amount of glamour surrounding the concept, and that the natural gas industry has developed a hard-hitting, convincing sales pitch.

Some electric utilities have already taken steps to meet the hard-driving gas campaign. Here are reports from a few selected utilities:

A Texas-based utility writes: "We have a committee composed of engineers that is accumulating as much competitive information as possible. We have also suggested to Southeastern Electric Exchange that this might be a good project for them to undertake. . . ."

A Florida utility replies: "We have not only made studies and plans, but have conducted several training meetings with our sales personnel to combat this type of competition."

Another Florida utility replies: "Educational work is being done with commercial sales people and sales allies to acquaint them with the all-gas concept and its weaknesses. Future plans involve heat pump, electric heating, electric cooking and electric water heating wiring allowances to make the all-electric concept more favorable."

Still another utility in the South says it is meeting the threat by "sharpening up our salesmanship."

But over in Mississippi the situation is different, and perhaps more typical of most other sections of the country. An electric utility there says no installations are imminent at this time and as far as can be determined, "there are no immediate proposals being made." Accordingly, this utility says, "At the present time we do not have enough information as to specifications, operating data, cost, etc., to solidify our thinking and the methods we could use to offset this competition."

However, individual gas utilities, notably Arkansas-Louisiana Gas Co, with the full support of the American Gas Assn, are managing to get in some sample installations and aggressively making proposals for a number more. Right now the Park Plaza shopping center in Little Rock (see next article) is a showplace for the gas turbine package installation, but a proposal has also been tendered for a research center-hospital in Arkansas, a commercial building in Atlanta, and the Northern Illinois Gas Co is making an installation in its headquarters building in Glen Ellyn, Ill.

At this point, Texas, Louisiana, Florida, and Arkansas seem to be the states getting the initial impact of the relatively new promotional campaign, but electric utility interest is general and many have attempted to analyze the possible consequences in their service areas. For example, Pacific Gas & Electric Co which sells both electricity and gas analyzed an American Gas Assn research study called "A Look at New Schools," only to find that standard lighting with heat pump year-around climate control was more economical in its territory because of the cost of natural gas.

Texas Electric Co, which is in the heart of the low-cost natural gas area, believes the gas-turbine concept is not fully developed. However it said:

"We believe that the gas turbine represents formidable competition and we are informing our sales

How Company Goes After 'All-Gas' Package Job

These two sets of comparisons were submitted to State of Arkansas by a gas company bidding for "all gas" service to a medical center and hospital

1. The gas company's preferred plan. Install two 750-kw natural gas turbine-generators and two 1,500-kw steam-turbine-generators for a total installed capacity of 4,500 kw. The cost breakdown showed—

	Present	Estimated Future
Installation Cost	$914,780	....
Operating Cost Increase for the Medical Center	44,930	$ 65,350
Purchasing Power Costs	129,620	160,890
Savings: Purchased Power Costs Less Operational Cost-Annual Rate	84,690	95,540

2. Alternate Installation. Install three 1,500 kw steam turbine-generators for a total capacity of 4,500 kw. The cost breakdown showed:

	Present	Estimated Future
Installation Cost	$960,360	....
Operating Cost Increase for the Medical Center	99,570	$125,650
Purchased Power Costs	129,620	160,890
Savings: Purchased Power Costs Less Operational Costs-Annual Rate	30,050	35,240

Is Threat?

engineers and commercial people concerning this device, its possibilities, limitations, etc."

Detroit Edison recalled that "... 15 or 20 years ago we had similar competition from the gas engine. But this fad ran its course when the few installations proved that higher over-all costs could be expected from this source of power."

Gas turbine promotional activity is now strongest in areas where gas prices are relatively low. Considering other market areas, Indianapolis Power & Light said,

"At only a few times during the entire year will the entire gas turbine plant be operating at the maximum efficiency (70%) claimed by designers—those few accidental or coincidental times when there is perfect balance in requirements. The majority of the time there will be no use for the major part of the exhaust gases. At these times, gas will be used predominantly for electrical generation—a situation which could not possibly be competitive with central station supply. In the bulk of the country, even utilities cannot afford to use gas for generation, but only for low-investment peaking plants."

Promotional activities by local gas companies in Louisiana and Texas are reportedly strong, but electric utilities there say local interest is low. Said Houston Lighting & Power,

"We have no evidence of actual negotiations between the gas companies and prospective commercial building investors in this area. Although gas company representatives have proposed gas turbine-driven generators for several projects through architects and engineers, we do not have any indication of interest on the part of the gas companies for building such a system of their own for demonstration purposes, or for supplying electric power to their own facilities. In general, there seems to be little interest in 'do-it-yourself' electric generation anywhere in this area except that shown by the gas companies."

The American Gas Assn booklet "A New Look At New Schools," prepared by a Houston firm of architects and engineers, Golemon and Rolfe, drew sharp criticism from Jack Coates of Ebasco Services and Benjamin Askew of Georgia Power Co, Askew analyzed the booklet for EEI's Electric Heating and Power Committee. Both pointed out that the booklet did not take all economic factors into account.

NATURAL GAS "Christmas trees" would replace electric service entrances if ambitious plans of the natural gas industry were to be realized

Articles in the AGA Monthly, the Southern Gas Assn Magazine, and in publications from the AGA Conference in New Orleans last April, all implied that a Beaumont, Tex., high school would have turbine generation. Gulf States Utilities Co in Beaumont has stated that it will supply all power to this school, and that it will be all-electric.

The Park Plaza shopping center in Little Rock, Ark., (see next page) is the first large commercial unit to have all electrical, heating, and cooling needs supplied by a gas turbine. This installation is served by Arkansas-Louisiana Gas Co and is in an area also served by Southwestern Electric Power Co. The electric company reports it has lost "quite a few" air conditioning jobs, especially commercial installations, because the gas company had the advantage of "heavy subsidies."

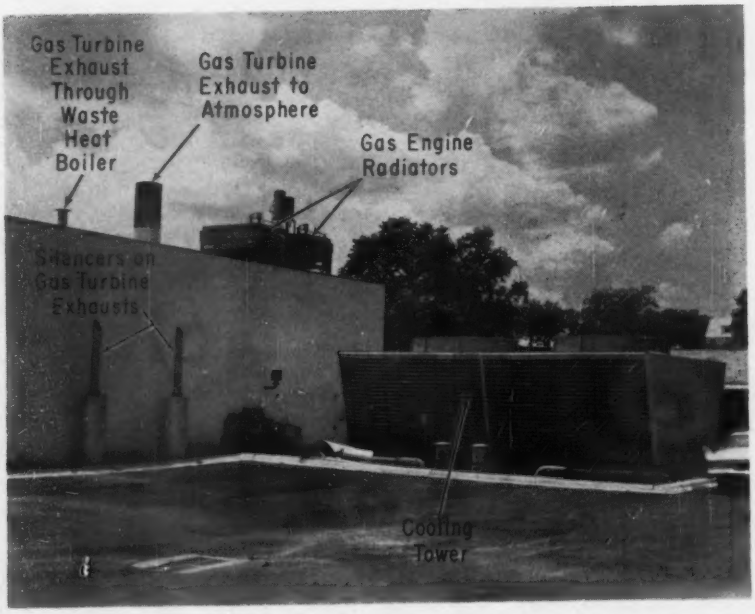
Southwestern also reports that United Gas and Arkansas Western Gas, both in Arkansas, have promoted turbine power very aggressively. Ark-La Gas bought Servel Co, and since then has increased its sales of gas-fired air conditioning equipment. According to Southwestern, Ark-La sells package-size air conditioning which they also install, finance, and service. For larger installations, Ark-La's efforts have been toward promoting absorption equipment as manufactured by Carrier, and other manufacturers.

Ark-La is reportedly negotiating for the purchase of most Ingersoll Corp assets; if the deal is closed, these assets would be held by a wholly-owned Ark-La subsidiary, Arla Air Conditioning Corp. Ingersoll, a 20-year-old company, fabricates natural gas engines, and also sells gas engines, diesel industrial engines, and diesel truck and marine engines; it has a Caterpillar gas engine franchise.

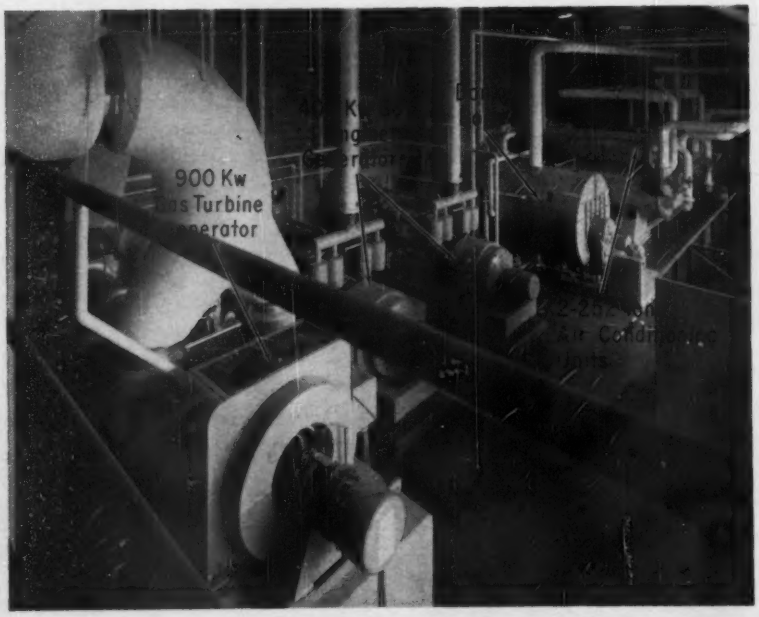
DO-IT-YOURSELF electricity will be a feature of this office building of Northern Illinois Gas Co at Glen Ellyn, Ill., but there are no other units in the area

Part II

Park Plaza Center—Gas Industry's


Gas Turbine Exhaust Through Waste Heat Boiler
Gas Turbine Exhaust to Atmosphere
Gas Engine Radiators
Silencers on Gas Turbine Exhausts
Cooling Tower

NOISE SUPPRESSION, a key problem of gas turbine-generator units, according to electrical industry observers, is handled through two mufflers at lower left



BASE LOAD UNIT is in the foreground at left, with standby units nearby. Power distribution control panel is out of photograph at right, facing standby units

Little Rock's Park Plaza shopping center with its isolated power plant is the gas industry's most publicized answer to the rapidly growing trend toward all-electric living. The initial developer was apparently encountering financial difficulties. His plans called for conventional electric service from the local power company. Construction had already started on the shopping center project.

Financial interests close to the gas industry moved in, took over the project and changed the plans to include the gas-turbine power plant and eliminate all connections to outside power sources. There is no question of standby service rates. The gas industry has no intention of maintaining standby service from an outside source.

Park Plaza is on a 24-acre site with 270,000 sq ft of store area and plans for expansion. It has been in operation seven months. Electrical demand has been around 900 kw with some store areas not yet occupied. Estimated demand with all of the existing store space occupied is 1,200 kw. A five-story department store has been proposed for Park Plaza. This load will be in addition to the present 900-kw demand, or the estimated 1,200-kw demand.

The power plant consists of one 900-kw Electric Machinery Manufacturing Co 277/480-v generator driven by a Ruston Hornsby gas turbine and two 400-kw Electric Machinery 277/480-v generators driven by Waukeshaw gas engines. The 400-kw units are to be used for peaking and standby service.

There are several factors of note in the plant design. The gas turbine was designed for continuous operation, as contrasted with aviation-type gas turbines which operate for relatively short periods at a time. Sources close to Park Plaza told *Electrical World* that the gas turbine is expected to operate 100,000 hr before the rotor will have to be pulled for replacement of the first-

Showcase

stage blades. The turbine, which is served with gas at 150 psi, is scheduled for inspection each 10,000 hr.

At full load the turbine exhausts 22 lb of gases per sec at 900F. These gases are passed through a waste heat boiler which generates 10,000 lb of steam per hr at 15 psig. The steam thus produced passes to a steam header which provides the shopping center with steam for heating, cooking and water heating.

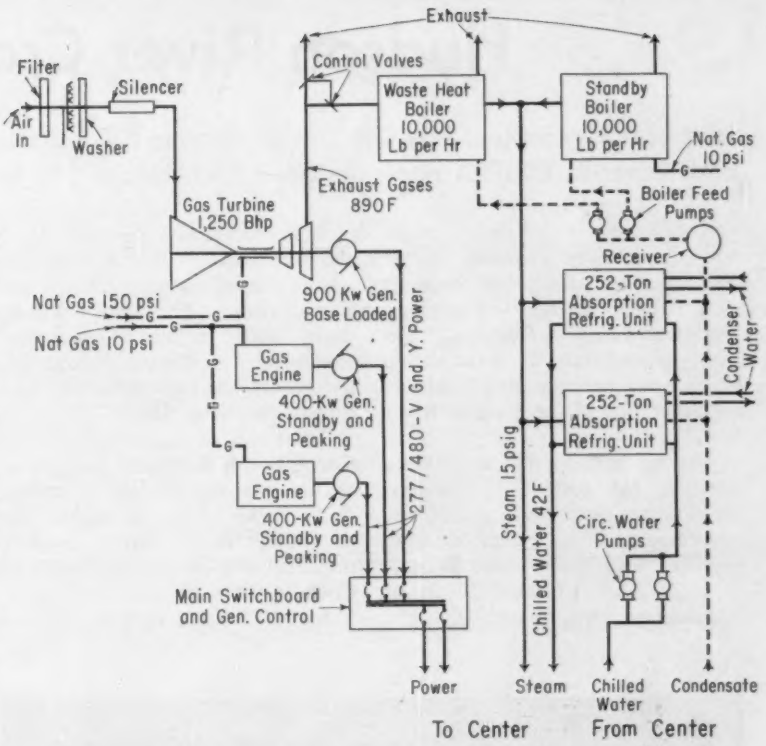
Steam is also tapped from this header to the two 252-ton absorption type refrigeration machines which air condition the shopping center. Steam requirements in summer are expected to be 11,000 lb/hr and winter 7,000 lb/hr.

When fully loaded the overall thermal efficiency of the turbine-driven generator and heat recovery system reaches 61.75% according to claims made in a report put out by the Arkansas-Louisiana Gas Co.

The 900-kw gas turbine generator is scheduled for use as a base load unit. It takes two hours to start up and put it on line and four hours to take it out of service. The 400-kw units can be started and put in service immediately. If the proposed five-story department store is added to the shopping center, plans call for the installation of a third 400-kw gas engine-driven generator.

When steam requirements exceed the amounts that can be generated with exhaust gases from the gas turbine, a gas-fired "donkey" boiler supplies the added requirements. The "donkey" boiler fires up automatically if steam pressure from the waste heat boiler drops below 12 psig and also serves as standby for the waste heat boiler.

When electric requirements are high enough to result in more exhaust gases from the turbine than are required to maintain steam from the waste heat boiler, the turbine gases are exhausted to the atmosphere. This, of course, reduces over-all efficiency of the operation. While there is some outside noise from the exhaust to the atmosphere, and it may be objectionable in some cases, the noise is perhaps less than might be expected and probably will not prove objectionable except under a few conditions.



MAIN POWER SUPPLY is a 900-kw gas turbine-driven generator, and there are also two 400-kw gas engine-driven generators for standby and peaking purposes

While very little factual information is available on the economics of the Park Plaza power plant, sources indicate that the break-even point depends on many factors. The gas rate at Park Plaza is 30¢ per million Btu and the load factor has ranged from 45% to 50%. Another important factor is the relationship of steam and electrical requirements. But it is said that the plant is making money for its owners.

The plant is manned by a plant manager and two shift operators. The manager lives across the street and has an alarm from the plant to his home so that he can be summoned promptly by a shift operator at any time. A 110-v connection from his home operates a clock in the plant to give them a check on frequency.

According to the information available to *Electrical World* the pay scale for the crew is appreciably lower than the rates paid to the operators in the average plant of a power company.

Distribution to the shopping center areas is over a series of 277/480-v feeders that are routed in conduit under a bridge that connects the power plant building with other buildings of the shopping center. Feeders are in aluminum conduit, which was specified because of its non-magnetic properties and consequent advantages from the voltage drop standpoint. Voltage drop at peak load on the 277/480-v system is 20 v. The system is designed to deliver 460 v to the load. The distribution is over a conventional radial system.

Power to shopping center occupants is metered and rates are the same as those of Arkansas Power & Light Co. Steam heat is metered and billed on standard gas heating rates and air conditioning is also metered and billed to the occupant of space on a Btu basis.

The Ruston Hornsby gas turbine was purchased for the Park Plaza plant because it was the only one available at the time that could be put into this type of service requiring continuous operation.

Hudson River Crossing Erected;

Joint-company project links Con Edison, Orange & Rockland; adds latter to ESUPRA pool; designed for ultimate 230 kv

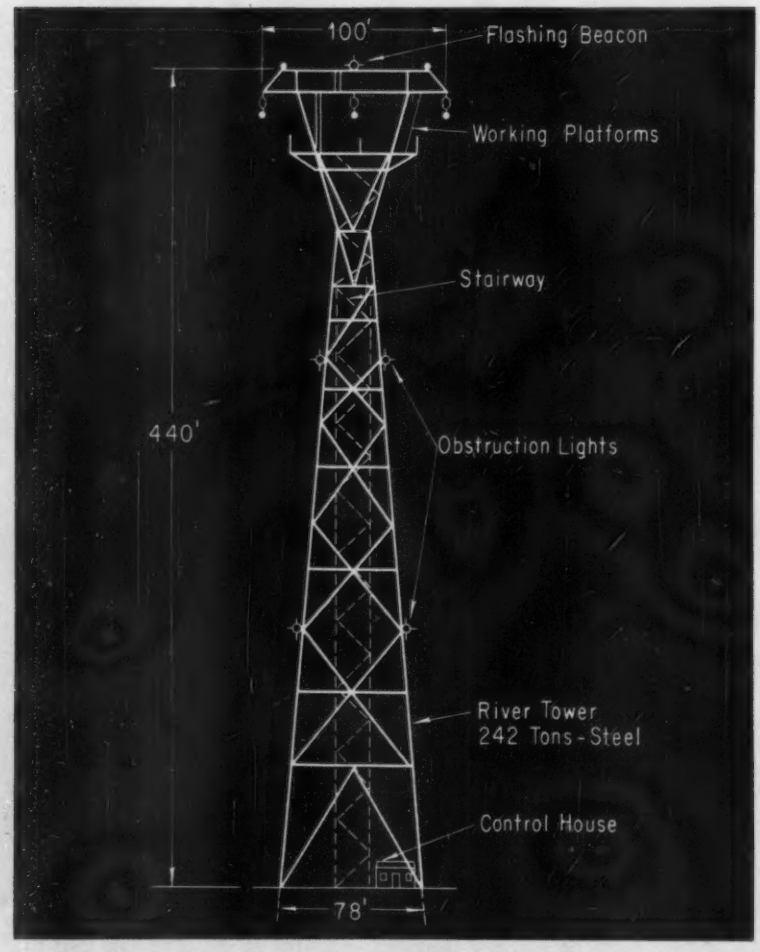
Construction of the longest single-span river crossing in the East, the first direct link between Consolidated Edison Co of New York and Orange & Rockland Utilities, was completed this month. The single span between 440-ft towers on either side of the Hudson River is 4,275 ft.

The tie will operate at 138 kv initially, but voltage is designed for ultimate operations at 230 kv, according to J. C. Fisher, division engineer, distribution structures bureau of Con Edison's Electrical Engineering Department.

Both companies participated in the construction of this link over one of America's most historic and scenic rivers. The river's history dates back to the 17th-century search for a northwest passage and its scenery has been compared with that of the River Rhine.

Terminals of the crossing are at Con Edison's Buchanan Substation, on the company's Indian Point Nuclear Power Plant property, and at Orange & Rockland's conventional Lovett Station at Tompkins Cove on the west bank of the river.

Initially, the tie supports Orange & Rockland, whose load growth is approaching the size for which its system, together with its tie capacity from Central Hudson Gas & Electric Co, requires emergency support. Later, as circumstances dictate, the tie will be used for economy energy or emergency support in either direction. The tie also links Orange & Rockland Utilities more closely to the southeast New York State power pool in operation since January 1, and incidentally, with the seven utilities which make up ESUPRA (Empire State Utilities Power Resources Associates).



TOWERS for the river crossing had to be high enough to support transmission facilities over the waterway, yet low enough to meet aviation requirements

The Hudson River, almost since its discovery, has been the principal waterway for upstate shipping. From time immemorial, birds have been guided by the river in their north-south migrations, similar use being made of it today by air traffic. Hence, besides the usual economic limitations of minimum transmission-line construction over land sections and minimum cost of acquiring right-of-way, the project was constrained to comply with special parameters. These were the official ones, established by the US Corps of Engineers and the Federal Aviation Agency.

Site Choice Narrowed

By imposing the upper and lower limits of the crossing's construction, these agencies narrowed the choice of sites for towers and anchors.

The Corps specified that clearance between the low point of the cable's catenary and mean high water be at least 160 ft to allow the safe passage of ships. FAA regulations kept tower height to elevation 500 ft maximum above mean sea level to protect air navigation. The latter requirement, indeed, became the determining factor in selection of the crossing site.

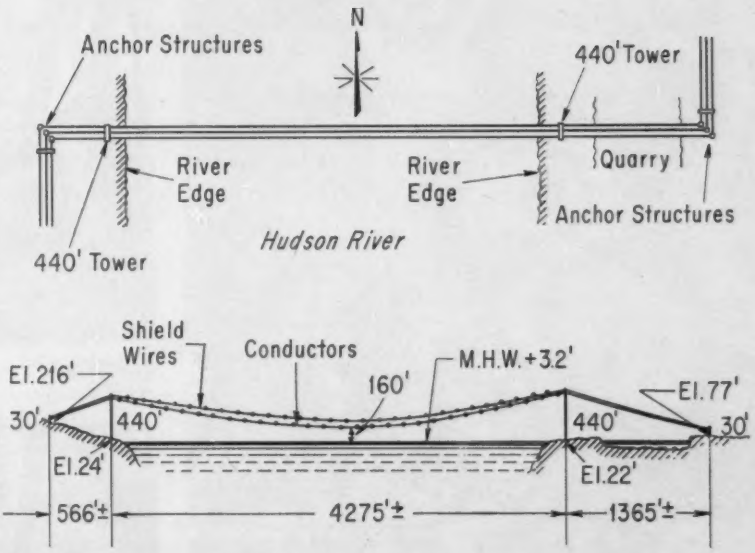
Paucity of land available for a transmission line, in effect, squeezed right-of-way width to the minimum 100 ft and led to the specification of the short back span which later posed a design problem. Length between station terminal points is 2¾ miles.

Basically, the crossing is a single circuit, having its phase conductors

East's Longest in Single Span

in a horizontal configuration and double shielding for lightning protection. The cables, as well as their supporting structures, were selected on the basis of studies which furnished data on wind velocities, prevailing wind direction, snow and ice accumulation, and possible seismic disturbances.

As limited by the amount of right-of-way that could be acquired, the back span is only 566 ft on the west end, but 1,365 ft on the east. River towers are well within FAA height limitation, only 440 ft. Horizontal spacings between shield wires are 80 ft and between phase wires 50 ft. Vertical clearance between shielding wires and conductors at midspan is 50 ft. The shield wire was designed as a high-strength steel wire cable, having a sagging characteristic compatible with the conductor, and its final construction consists of a 37-strand No. 7 Alumoweld wire.

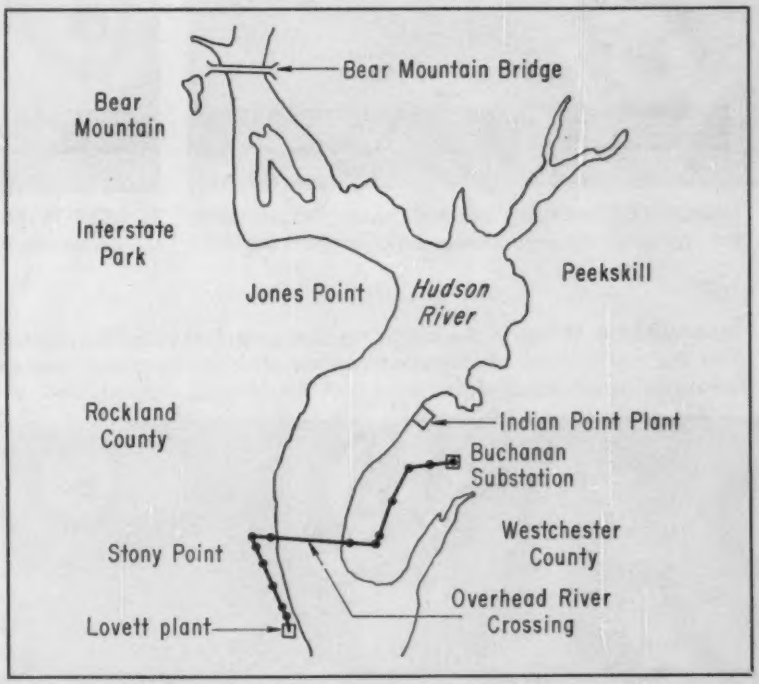


PROFILE of the crossing, looking north, shows positions of anchor structures, towers, dimensions and sag of conductors, shield wires, elevations

Allows Lighter Towers

The crossing's conductor is special 957.9-MCM ACSR, consisting of 62 aluminum and 61 steel wires. This 1.5-in.-dia conductor has a breaking strength of 123,500 lb and a bare weight of 3.09 lb per ft. At 185F, it is rated for 225 Mva at 138 kv, the initial voltage, and 375 Mva at 230 kv. The 1-in.-dia shield wire has 37 No. 7 aluminum-encased steel wire strands, a breaking strength of 100,700 lb, and a bare weight of 1.76 lb per ft.

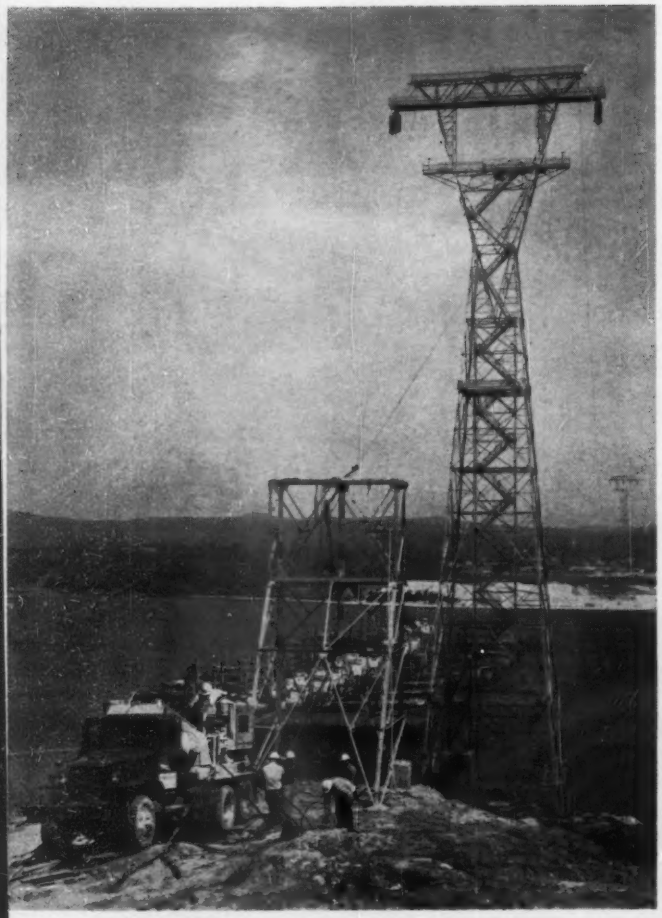
Conductors and shield wires are supported at the river towers by a suspension-type attachment designed to permit enough movement of these wires to compensate partially for the change in wire length in the river span produced by variations in wire loading and thermal effects. This attachment reduces appreciably the wire loads transmitted to the river towers. This, in turn, allows the use of lighter suspension towers.



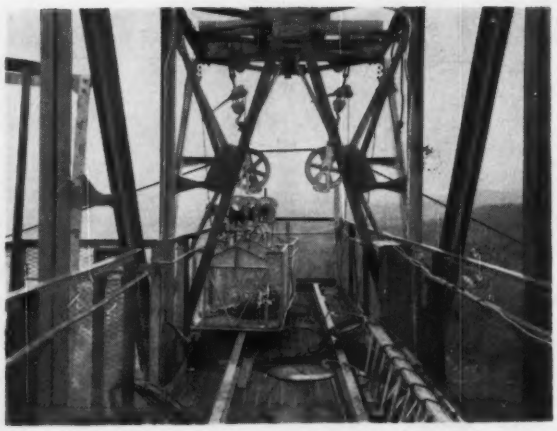
CROSSING links Buchanan Station with Lovett Plant, tying Con Edison transmission to that of Orange & Rockland and the latter to ESUPRA companies

Conductor support at the river tower is a six-string insulator assembly of 14 EHS (36,000-lb) units per string, the assembly having an equalizer adjustment yoke and hanger plates. The entire assembly was made up at the factory and then tensioned and braced for shipment as a unit to the job site. The conductor is attached to the insulator string through a nodular iron spreader plate and a double armor grip assembly.

The shield-wire support at the river tower is similar to the conductor attachment except that the insulator hanger is omitted. The shield wire's strength is reinforced by an extra layer of armor grip



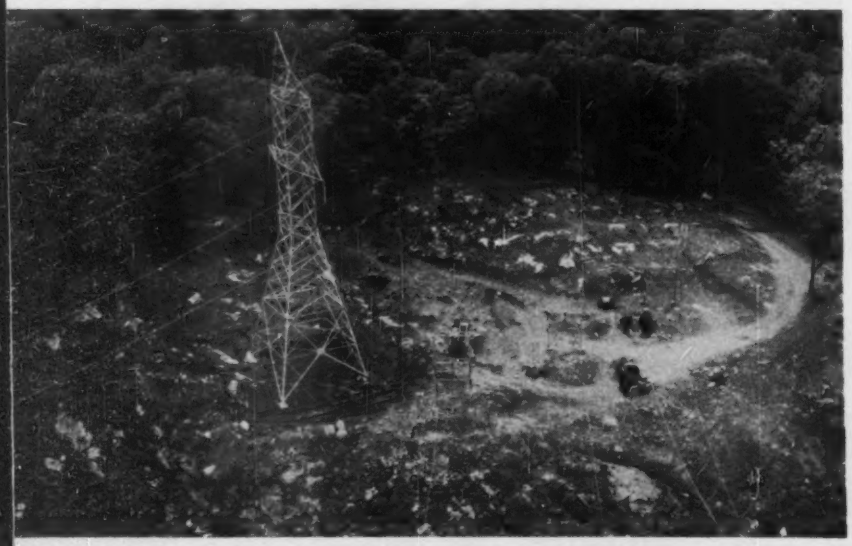
BOTH RIVER TOWERS are shown during conductor stringing last spring. Photos were furnished by Orange & Rockland



GONDOLA, hung on any wire, is for personnel inspecting, maintaining conductors, shield wires, and safety spheres

TOWER-TOP TRAVELING BOOM on dolly truck is used principally for suspending gondola on the river span cables

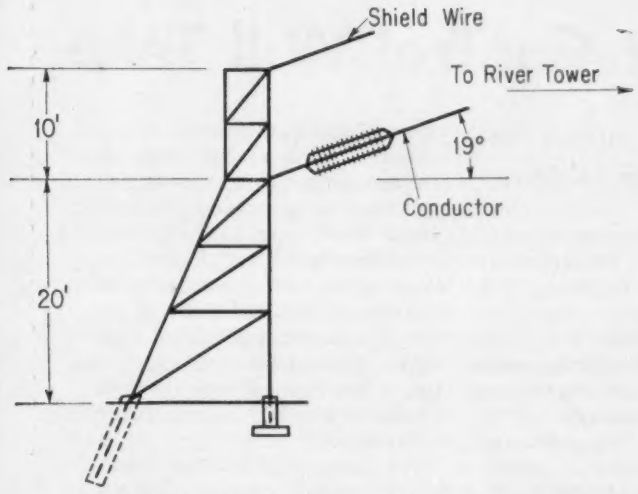
TRANSMISSION TOWER is the first in the Orange & Rockland 138-kv system after the river crossing. Smaller structures are west anchor towers to which outside conductors, shield wire are tied back individually



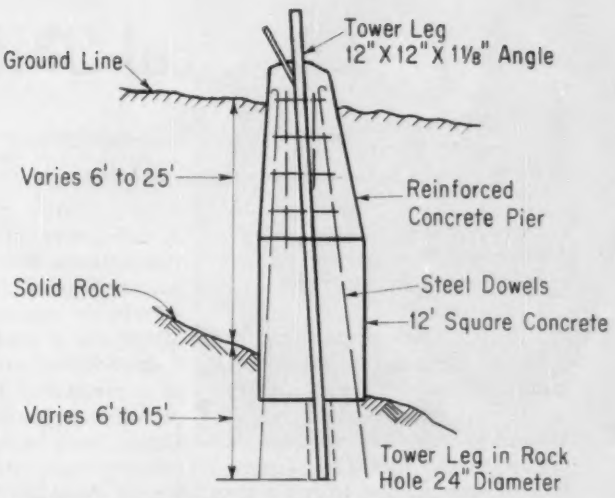
wires extending beyond the extra-length, double-suspension grip assembly.

The conductor dead-end attachment is six strings of 16 EHS (36,000-lb), also assembled and shipped under tension. The conductor was attached to the insulator string through a specially designed socket-type compression fitting, which was made up over an armor grip reinforcement shield. The shield's extension about 20 ft beyond the fitting was intended to minimize stress concentration at the wire dead-end attachment.

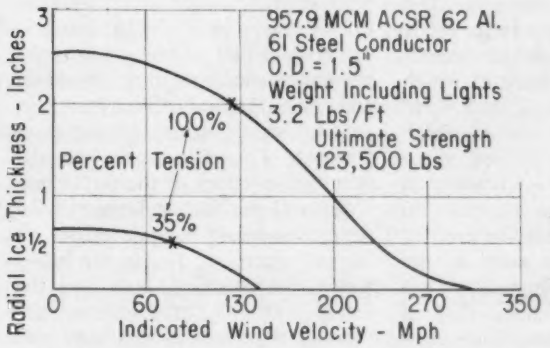
The shield-wire deadend was made similarly to the conductor connection but lacks the insulator string assembly. Instead, the compression terminal fitting has a lug connector for a solidly grounded bond to the anchor structure. The attachment to the anchor structure



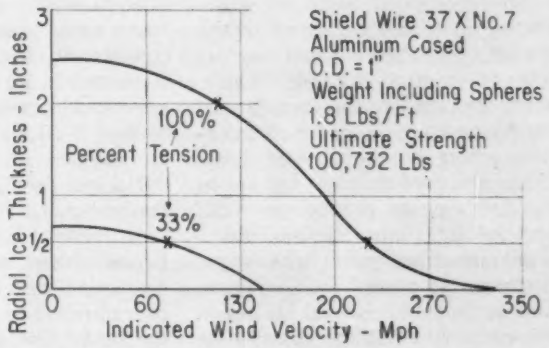
ANCHOR STRUCTURES of 1¾ tons of steel stabilize both conductor, shield wire, three at each end of crossing



RIVER TOWER FOOTINGS were designed to support towers under conditions of tower loading with overload factors



CONDUCTOR SIZE was selected on the basis of studies of wind and icing, while supporting required safety devices



SHIELD WIRES, like conductors, were tensioned to resist wind and icing, while supporting required safety devices

is a shackle strain plate connection.

The main tower leg members were fabricated from 12½ x 12½ x 1⅛-in., high-strength, low-alloy steel plates with the edge and fillet welded to an angle shape. Inside braces on intermediate spacing give edge stiffness, the braces also serving as bracket locations for tower lighting conduits.

A calculated minimum stiffness ratio was specified for all members in the superstructure portion of the river tower. This ratio minimizes the effects of cyclic stress inducible by vibration. All member joints in the upper sections of the tower and crossarm framework were detailed for at least three bolts per connection.

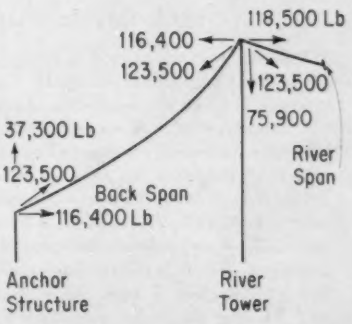
Access to crossarms' working platforms and intermediate platforms is the center stairway well. The stairway structures, though self-supporting, have lateral braces to the horizontal panel frame of the tower body.

On both sides of the river, conductors and shield wires are anchored at framed structures, three at each end of the crossing. Outside conductors and shield wires were tied back to the individual anchor, and the center conductor has its separate anchor. The short back spans have the effect of increasing the wire uplift loading considerably, so that, were the full anchorage of all five wires carried to a single anchor tower, tower structures and foundations would have been indeed expensive.

Station-tie transmission lines at both ends of the river crossing are at about right angles, a situation that would have also imposed a heavy wire load on the anchor structures. Terrain, too, favored the low, light-frame separate anchor structures.

The foundation design called for extending the tower legs into a hole cored in rock, the depth of the hole determined by the resistance to the

(*Continued on page* 54)



LOADS on structures and back spans are shown for one broken conductor

Spectral Shift Control Will Take

Heavy water added to coolant-moderator enables improved reactor control and better neutron economy

MILTON C. EDLUND, Manager, Development Dept, Atomic Energy Div, Babcock & Wilcox Co, Lynchburg, Va.

Power output increases up to 70% are estimated for pressurized-water reactors with the reactor controlled by the moderator instead of control rods. This spectral shift control reactor (SSCR) is expected to cost less per kw to build than ordinary pressurized-water reactors and to operate on fuel cycles 1 to 2 mills per kwhr cheaper.

The concept is based on a departure in reactivity control of the reactor core. Present water reactors rely on control by rods, which, when inserted into the core, absorb excess neutrons in order to maintain power at the desired level. These absorbed neutrons are lost to the core's power production. With spectral shift control, the moderator, a mixture of heavy and light waters, performs the control rods' function, and neutrons that would be lost in the ordinary PWR are absorbed in fertile material to give more fuel.

The heavy water proportion of the moderator mixture is decreased during the life of a core to control long-term reactivity. Like an ordinary PWR, the SSCR still has control rods for safety shutdown, temperature defect and power Doppler coefficient. But the heavy water concentration is adjusted so that all control rods are fully withdrawn at full power. This concentration varies from about 70 molecular percent D_2O at the beginning of a new core's operation to about 5% at the end of core life.

An SSCR is essentially the same as a pressurized-water reactor except that it has provisions for injecting heavy or light water into the primary loop, extracting the mixed waters from this loop, and reconcentrating the heavy water from them. Reconcentrating calls for a heavy water plant. One using distillation is the most economic. The heavy water plant for a large SSCR consists of seven packed towers connected in series, three of which are enriching sections (2 mol % to 98 mol % D_2O) and four of which are stripping sections (2 mol % to 0.015 mol % D_2O). Each tower in the enriching section has several feed points that permit the feed to be introduced at the point in the distillation system where the D_2O concentration is equal to that of the feed. The system is designed for constant feed rate of water for all concentrations of D_2O from 2 mol % to 98 mol % or a variable output rate of 98 mol %, whose rate is determined by the concentration of heavy water in the feed.

The idea of the SSCR grew from B&W's work on reducing energy cost of PWR. Two areas offered room for substantial reduction:

- Neutron economy
- Core power distribution

Spectral shift control improves neutron economy by decreasing neutron losses so that saved neutrons can be absorbed in fertile material to produce additional fuel. Control is needed to compensate for the reactivity of the fuel mass in excess of that just required for criticality. This excess fuel mass is large when charged into the core in order to gain high burnup, hence minimum fuel costs.

The reactivity of the close-packed lattices typical of PWR cores can be changed by the addition of heavy water primarily because heavy water is a much poorer moderator than light water. Because the slowing power of light water is seven times that of heavy water, the resonance neutron flux increases and the thermal flux decreases as the heavy water concentration goes up. The ratio of the absorption cross-sections of the fertile material and the fuel is larger in the resonance-energy region than at thermal energies. So, as the heavy water concentration goes up, the fertile material absorbs more and more of the available neutrons, and the critical mass must also increase. Thus, by the neutron-spectrum shift —hence the name, spectral shift— toward the resonance region, the fertile material acts as a control rod.

This absorption in fertile material improves the conversion ratio over an ordinary PWR controlled by rods (graph right). The conversion ratios shown are for the same core. The best neutron economy is obtained with the Th-U^{233} cycle. On this cycle, a SSCR would start with 93%-enriched U^{235} fuel and thorium as fertile material. Such a reactor that recycles the bred fuel every 10,000 Mw-days per ton of Th will probably achieve a conversion ratio of unity on the fourth and succeeding cycles. Because the mass of fuel required for this equilibrium cycle is only about half the U^{235} for the first cycle, no additional U^{235} needs to be supplied after the first charge. There will even be a surplus of about 15% of the U^{235} charged into the first cycle. Although the SSCR may breed for fuel exposures of 10,000

SSCR Development in Progress . . .

The AEC recently signed a $211,000 contract with Babcock & Wilcox Co for an SSCR plant analysis study. The company has had a $1,223,500 AEC contract for basic physics on the spectral-shift concept since July 1, 1960 and has completed to date six critical-assembly experiments, three exponential-assembly experiments, one hot exponential, and four age exponentials. A zone-loaded critical has recently been in progress.

The first critical assembly containing D_2O with 4%-enriched UO_2 fuel went critical Feb. 23, 1961 at a fluid concentration of 76.7 molecular percent D_2O. A calculation indicated 79%. Hence, the calculation was conservative. This first critical has essentially proved that the method of calculating SSCR cores is accurate and reliable. The 76% concentration holds only for the particular core tested. Concentrations will be different for different cores: e.g., a large stainless-steel-clad core needs only 63% D_2O.

PWR a Step Forward

Mw-days per ton, the lowest energy costs will result with fuel cycles in which the fuel is irradiated to 20,000-25,000 Mw-days per ton. The conversion ratios for these equilibrium fuel cycles will be about 0.95. The uranium mass balance for a 1,000-tMw SSCR operating with a 20,000-Mw-day-per-ton cycle are shown in the table (p 38).

The second area in which spectral shift control leads to a significant improvement over a rod-controlled PWR is in flattening the core power distribution. In the SSCR, the slow reactivity changes during burnup can be compensated by decreasing the proportion of heavy water in the primary coolant-moderator. Thus it is possible to operate the reactor with no control rods inserted into the core at full power. With the elimination of the power-distribution distortions caused by control rods, it is possible to obtain a high degree of power flattening over the entire core life by proper distribution of fuel in the core.

A typical fuel loading pattern with a maximum-to-average power ratio in the core of less than 2 to 1 is achieved by loading the fuel in three radial and two axial zones. In contrast, the maximum-to-average power ratio is usually greater than 4 to 1 in an ordinary PWR.

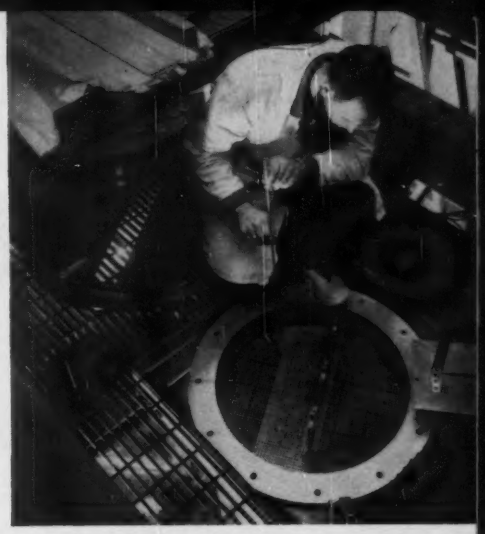
Because the increase in the enthalpy of the coolant in the hot channel is limited by burnout heat flux conditions, the power capability of a reactor primary system increases almost inversely as the ratio of maximum-to-average power for the coolant channels. (This is strictly correct only for the same axial power distributions.) A PWR primary reactor system is estimated to produce 70% more power when operated as an SSCR.

This improvement in power density not only results in large savings in the unit capital cost of the reactor primary loop but also leads to savings in shielding and containment costs. A 1,100-tMw primary reactor system, including the steam generators, could be contained in a 125-ft dia sphere, the size now built about 500-tMw PWR.

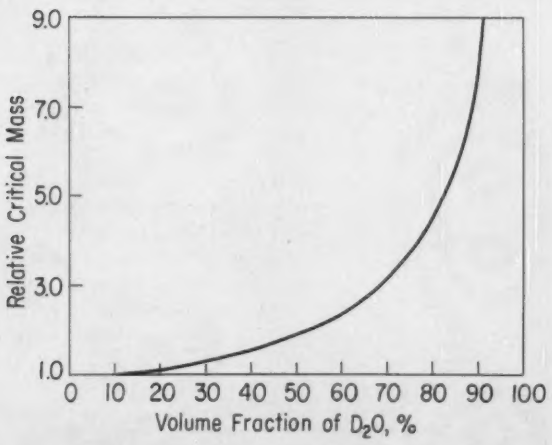
An evaluation of the economics of spectral shift control can be made by a direct comparison of the reactor portion of a given power plant with and without spectral shift control. A 200-Mw ordinary PWR with low enriched fuel will serve as a basis for comparison. This plant, based on current technology, has 97 control rods to compensate for the power, Doppler coefficient and fuel burnup and has a soluble poison for compensating temperature defect to reach an average fuel exposure of 20,000 Mw-days per ton. The maximum-to-average power ratio is 4 to 1.

This plant's capability can be increased to 350 Mw through the substitution of spectral shift control for rod control. The components of the SSCR, except for the heavy water concentration plant, are the same as those of the ordinary PWR. The output improvement is a direct consequence of the better power distribution that can be gained with spectral shift control. The maximum-to-average power ratio improves to about 2 to 1.

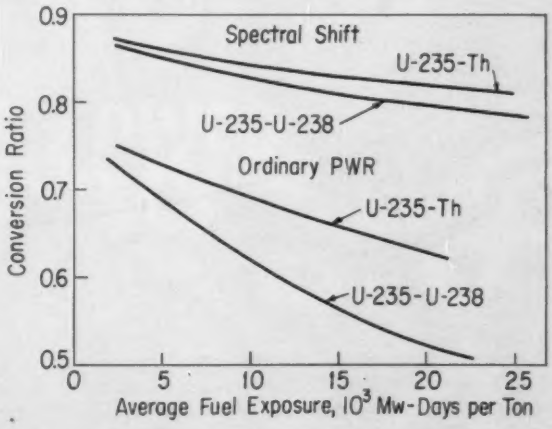
Spectral shift control, as mentioned before, calls for the addition of a heavy water plant. The control rods remain, but are chiefly for scram. The heavy water distillation plant cost adds $1.50-$2.00 per kw to the capital cost and its operating costs contribute less than 0.03 mill per kwhr. D_2O loss is esti-



FUEL PIN is loaded into spectral shift control exponential experiment



CRITICAL MASS increases as D_2O proportion goes up because heavy water is a poorer moderator than light water



FERTILE MATERIAL in SSCR absorbs neutrons that get lost to control rods in current pressurized-water reactors

Uranium Mass Balances for Recycle of U^{233} in an SSCR

Thermal reactor power: 1,000 Mw
Irradiation per cycle: 20,000 Mw-days per ton of thorium

	Cycle 1	2	3
U^{233}, kg			
Initial	0	386	540
Final	502	523	510
U^{235}, kg			
Initial	1,030	254	95
Final	333	74	72
Integrated conversion ratio	0.80	0.92	0.95

Makeup quantities from 2nd to 3rd cycles can be taken from cycle 1 leftover.
Initial thorium charges are 32,600 kg in core and 2,970 kg in blanket

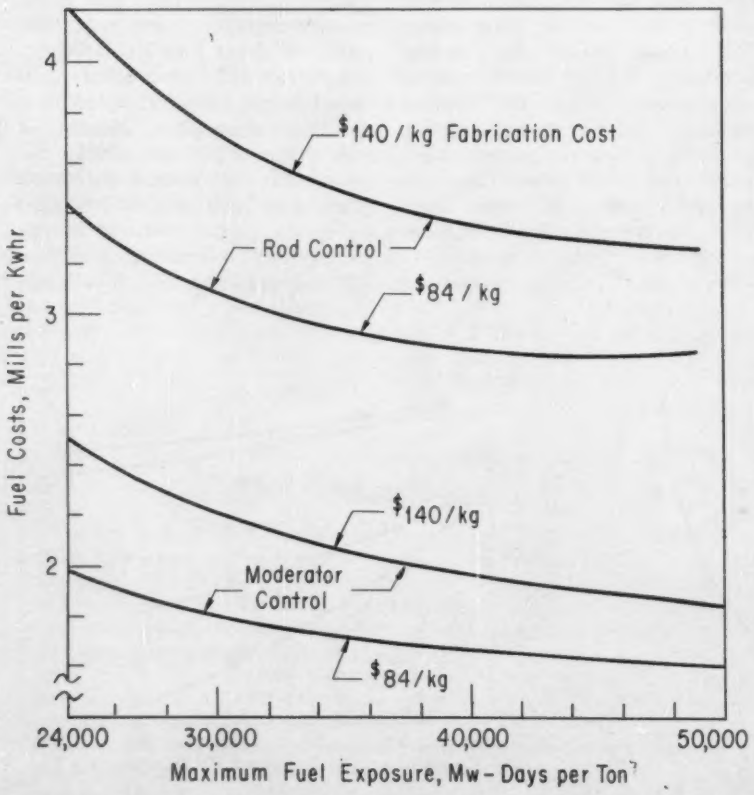
mated to be less than 1% of the inventory per year. The heavy water investment is in the range of $10-$15 per kw. The total contribution of heavy water to the energy costs is expected to be 0.2-0.3 mills per kwhr for a large SSCR. A comparison of capital costs between an SSCR and an ordinary PWR of comparable power outputs shows a capital cost of $245 per kw for a 300-Mw PWR and $191 for a 340-Mw SSCR, or 4.9 and 3.7 mills per kwhr, respectively. These figures are based on 14% fixed charge rate and 80% load factor.

The fuel cycle costs shown in the adjacent figure are based on 4%* lease charge on the fuel inventory, which comprises one core in the reactor plus one core out of the reactor for eight months per cycle. For these costs, the maximum-to-average fuel exposure for rod control is 2.4, which is attained by zone loading and fuel reshuffling. With spectral shift control, this ratio is about 1.5. These figures are for uranium oxide fuel. A factor contributing to lower SSCR fuel cost is the lower enrichment required to gain the same burnup. At 20,000 Mw-days per ton, for instance, the enrichment for the SSCR is 2.17%, for rod control, 2.79%.

As mentioned above, recycle of U^{233} in the SSCR offers the ultimate potential for reducing PWR energy cost. The major developments required to reach this goal are the production of long-life, high-temperature zirconium alloy tubing and relatively low-cost fabrication procedures for hot fuel.

We need a zirconium alloy capable of withstanding corrosion and hydriding in heat fluxes of 400,000 Btu per hr per sq ft at surface temperatures of 600-650F in contact with water over periods of two to three years. The alloy must also be sufficiently resistant to radiation damage to withstand fast neutron exposures of 3-5x10^{22} neutrons per sq cm. Preliminary tests indicate that Zircaloy-4, as well as some of the zirconium-niobium alloys, will be satisfactory.

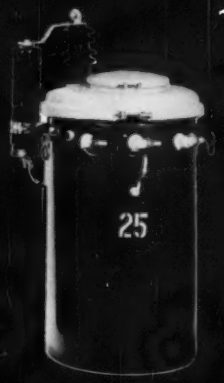
Because the uranium to be recycled contains 500-1,000 ppm of radioactive U^{232}, fabrication must be carried out remotely. Recent developments in producing high-density oxide powders that can be vibration-compacted in tubes to densities of 90% or more appear to make the solution of this problem tractable. Preliminary engineering studies indicate total recycling costs, including reprocessing, transportation and thorium fabrication, of $150-$175 per kg of Th. For an average irradiation of 20,000 Mw-days per ton of thorium, the total fuel cost would be 1.2-1.5 mills per kwhr on the U^{233}-Th cycle.



COMPARATIVE FUEL CYCLE COSTS show margin for spectral shift (moderator) control over control rods in pressurized-water reactor

* Based on pre-July 1 AEC prices. Under the new schedule, the lease charge is 4.75% and uranium prices per kilogram are decreased (EW, June 12, p45); fuel costs for the SSCR are reduced about 0.4 mill per kwhr

LOWER
TOTAL
OWNING
COST



GENERAL ELECTRIC ANNOUNCES . . .

PERMALEX® 65 DISTRIBUTION TRANSFORMER

Switch to 65C operation enables utilities to take full advantage of General Electric's Permalex transformer insulation system . . . *with no change in operating practice*

GENERAL ELECTRIC

Forty pounds lighter and five inches shorter: this is how the 25-kva, 7200-volt PERMALEX 65 distribution transformer compares with its 55/65C predecessor. Similar reductions in size and weight are made on all PERMALEX 65 transformer ratings. This new, smaller, and lighter transformer offers substantial savings to electric utilities on "joint use" poles, as well as in installation, changeout, and inventory costs.

SMALLER SIZE, LIGHTER WEIGHT

55/65C		65C
43 inches		38 inches
450 lbs.		410 lbs.

Redesign of General Electric's Permalex transformer into the single-rated PERMALEX 65 design also brings new reductions in utility distribution-system operating cost. Copper and iron losses have been lowered and, through lower impedance, regulation is improved. These improvements will help utilities meet increasing loads and their requirements for better voltage and service continuity—with greater economy and reliability.

LOWER OPERATING COSTS

With the introduction of the PERMALEX 65 distribution transformer, General Electric continues its program of passing manufacturing cost savings on to utilities in the form of lower purchase price. Chart of popular 25-kva, 7200-volt, no tap rating (below) illustrates how G.E.'s initiative in sharing cost savings has lowered utility capital expenditure on distribution transformers since 1957. Price reductions have been made on all PERMALEX 65 transformers in preferred-kva ratings.

LOWER PURCHASE PRICE

How General Electric insulation research paves the way to lower transformer total owning cost

Cyanoethylated kraft insulation, heart of G.E.'s transformer insulation system, was developed by skilled chemists in General Electric's distribution transformer insulation laboratory in Pittsfield, Mass. The new PERMALEX 65 design makes *full* use of G.E.'s thermally superior insulation system, permitting new reductions in size, weight, and purchase price of distribution transformers.

Lower total owning cost for distribution transformers is a prime General Electric objective. Historically, the stage was set for the 65C-rated transformer in May, 1959, when General Electric announced its high-temperature Permalex transformer insulation system. Then, in 1960, G.E. introduced its "dual-kva" rating. A second kva rating was assigned to Permalex transformers, based on 65C average winding rise. This served as an intermediate step to the development of today's single-rated 65C unit.

General Electric's new PERMALEX 65 transformers cost less to purchase, to install, to operate, and to change out. *This* is Lower Total Owning Cost. Your G-E sales engineer has the complete story. Section 482-25, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

'Bare-Hand' Technique Not for Distribution

C. CLYDE CROCKETT, Transportation Supt, Louisiana Power & Light Co, New Orleans, La.

For electric utilities having transmission lines which cannot be taken out of service for maintenance and repairs, the "Bare-Hand" technique (EW, Dec. 19, 1960, p 74) is an acceptable method of doing this work. However, such a technique presents numerous problems when used on *distribution* systems, where a second phase wire or a ground wire is within reaching distance of the lineman.

Essentially, the bare-handed technique involves placing a conductive pad in the bottom of the basket and connecting this pad to the energized conductor on which the lineman intends to work by means of a flexible conductor and clamp. The lineman is, therefore, energized constantly at the potential of the conductor and may handle it at will without encountering the harmless but annoying "shocks" associated with the capacitance-charging effect each time he touches the conductor.

About seven years ago, Louisiana Power & Light Co first began to do hot-line work on 14.4-kv circuits from aerial-basket devices, using rubber gloves. Rubber gloves were used then, and are used now, to eliminate these capacitance-charging shocks because we believe that this is the safest way to do distribution-circuit hot-line work from insulated aerial baskets—no "clamp-on" direct connection, between insulated basket and energized line, is used.

In using aerial basket devices for working distribution circuits, there are *two* basic insulation requirements; while there is only one in connection with such work on transmission circuits. In hot-line working of distribution circuits (34.5 kv and below), one is concerned with: (1) protecting the man in the basket from electrocution; and (2) protecting the workmen and general public on the ground from electrocution through coming in contact with a "hot truck." The latter consideration was solved primarily by the "insulated outer-boom assembly."

'Basket' Is Most Important

The *bigger* problem, that of protecting the man in the basket when working on hot *distribution* circuits, has yet to be completely resolved. Obviously, when a man in a basket is working on distribution voltage circuits, which are generally installed on 8-ft or 9-ft crossarms, he has the hazard of accidentally coming into contact with phase wires or ground wires other than the one on which he is working at the moment. This hazard is not present when he works on transmission voltages because of the much greater physical separation of conductors—consequently, a well-insulated basket *per se* is of relatively little importance in transmission line work. On distribution work, however, the man's very life often depends on the insulation *through* the side wall or bottom of the basket in which he is standing.

Picture, if you will, a lineman in a basket working on one phase of a 3-phase, four-wire, 24-kv feeder. The voltage of the phase to ground is about 14 kv. Also picture a grounded neutral wire against the side or bottom of the basket with the lineman's leg or foot directly opposite this ground wire, and you can readily see how important the basket insulation becomes when we talk about working distribution voltages hot. To the man in this basket, the excellent insulation from basket to ground by way of the boom is relatively unimportant—the insulation which protects *his* life is the insulation of the basket itself.

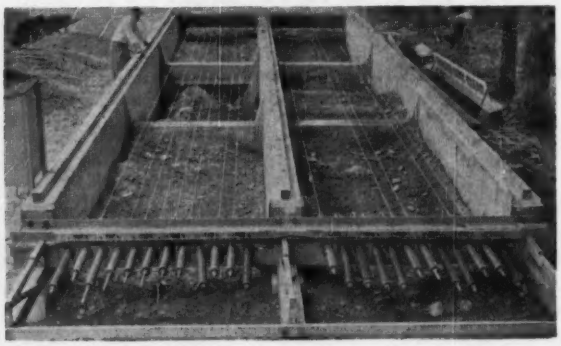
For seven years now, Louisiana P&L has been testing baskets at 45 kv for 30 sec every two weeks or at any time upon the request of the lineman (EW, Feb. 13, p 114). The recently developed dense polyethylene basket *liners* permit "liner" shop testing to 50 kv for 1 min. We still make routine dielectric tests of the basket itself every two weeks and will continue to do so until experience shows that it will be absolutely safe to lengthen this test period (see page 13). The use of "liners" minimizes "down time" of the aerial device itself for making tests and repairs. As an added precaution on live-line distribution work, all phase wires and grounded neutral wires within reach (other than the worked wire) are covered with rubber line hoses, blankets, hoods, etc.

'Clamp-On' Connector Poses Problems

Regardless of the currently available protection afforded the lineman, the "bare-hand" technique is not safely applicable to distribution circuits. The use of the "clamp-on" direct connection, between the aerial basket and the energized line, constitutes a fundamental hazard. Consider, for instance, what would happen if the lineman should forget to disconnect the basket's metal platform on which he is standing before he reaches over to work on the next phase wire. Furthermore, it is not difficult to picture what would happen in the case of a two-basket unit where one man's "basket" is connected to "A" phase and the other man's "basket" is connected to "C" phase—and one lineman hands the other lineman a wrench or piece of material.

Hot-line maintenance work in any form—either "barehand" directly connected to the energized line, or with rubber gloves and not directly connected—is a new way of life for the lineman. The new approach to line maintenance has numerous advantages and it can be a completely safe method, if electric utilities move with caution when establishing working rules and safety regulations.

Sustained Tension Verifies Single-Sleeve ACSR Splices

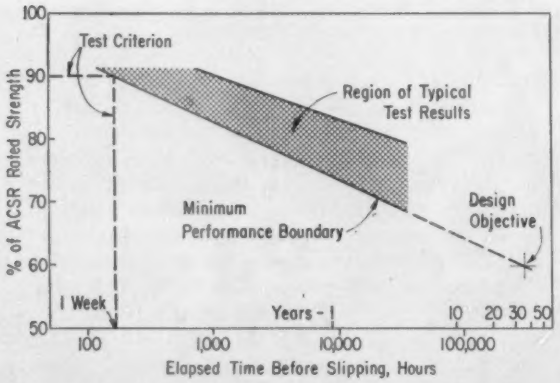


OUTDOOR TEST RACK with calibrated springs holds spliced 50-ft spans under tension for up to 4 years. Elapsed time to failure is recorded by hour counters in cabinet at left

I. MATTHYSSE, Chief Engineer,
E. S. RAILA, Supervisor-Connector Design, Utility-Industrial Division, Burndy Corp, Norwalk, Conn.

Single-sleeve compression splices which hold ACSR without slippage for 7 days at 90% of the conductor's ultimate strength offer added convenience in the installation of distribution conductors. This criterion has been selected as an accelerated test to simulate 30 to 40 years of normal loading at 25% of rated strength, fairly long periods of ice and wind loading at 50 to 60%, and brief periods of near-ultimate stress from falling trees or a broken pole.

To meet this criterion, the splice must grip securely both the aluminum strands of the ACSR and its steel core in such a manner that each metal carries its share of the stress. The steel core must be held by friction with the surrounding aluminum strands, held in contact by pressure maintained by the splice. But excessive pressure causes the soft aluminum to creep, relaxing its grip enough to permit the steel core to slip slowly under sustained tension. Using a properly-designed splicing sleeve containing compound with grit of optimum size and hardness, and pressing it on the ACSR with a sufficient number of crimps, will make a splice which meets the criterion for long service.



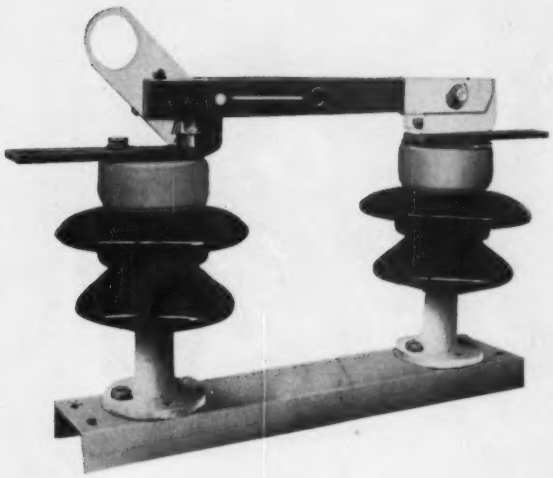
TEST DATA establish relationship between tension and time before splice failure. Minimum-performance boundary shows 35 years at 60% rating, one week at 90% for test

Tests to verify this technique must approximate, in a reasonable time, the extremes of sustained tension expected in service. Accordingly, a large number of splices were held at elevated tensions in an outdoor test rack until they failed. Some are still under tension after four years. When the resulting mass of data was plotted as log time vs % of conductor rated strength, the points fell in a region that could be bounded by two straight lines. Of these, only the lower one, marking the minimum limit of performance, is significant. And this limit, extended as a straight line on the semi-log paper to reflect other available data on aluminum's creep characteristics, indicated that splices on ACSR at 60% of rated strength should hold for 35 years or longer.

Conventional tests, such as applying tension to a spliced conductor at a strain rate of 0.5 in. per min until it fails at 95% of ultimate, are entirely inadequate for testing single-sleeve splices on ACSR. This has been demonstrated by applying sleeves with half the recommended number of crimps. Such a splice, although capable of holding 100% of the conductor's rated strength in a conventional test, fails in a few hours at 90% of rated strength and accordingly could not meet the design objective of 60% for the life of the line.

Sustained tension testing thus seems essential to developing and verifying single sleeve splices for ACSR. But considerable acceleration was needed to simulate life-time performance in a reasonable test period. Here, again, the minimum limit line of the test data graph was used to select 1 week at 90% of rated conductor strength as the equivalent criterion.

The new test does not supersede such other tests as vibration, high temperatures caused by excessive current, high ambient temperature, and extreme load cycling. These must still be checked in the usual way in developing new connectors and splices. But sustained tension must be applied to several samples from each production lot and must take its place as a principal acceptance test for users of single-sleeve ACSR compression splices.

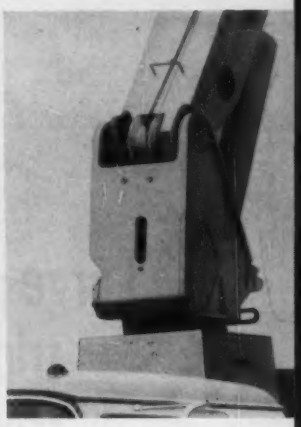


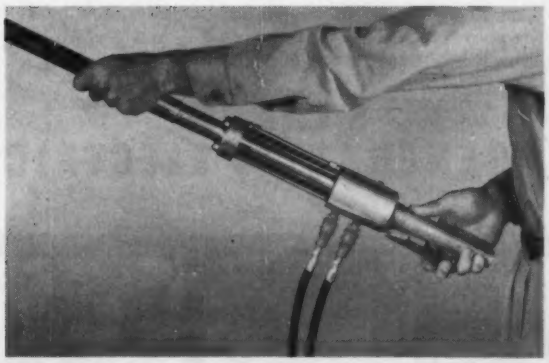
Hook-Operated Air Switches...

. . . featuring solid silver contacts on the clip end, have momentary ratings of 20,000 and 40,000 amp. For hinge-end contacts, annular, solid-silver washers are utilized. AgH air switches, 7.5 kv through 34.5 kv, 400, 600 and 1,200 amp, are available as single-pole, single-throw or as single-pole, tandem-transfer units. Widely spaced, parallel blades of hard-drawn, high-conductivity copper are of unitized construction to provide a rigid blade unit which reportedly will not deflect under most severe operating conditions. One-piece, mechanical latch and hookeye has a ¾-in. pry-off action. Switches meet NEMA, ASA and AIEE standards; terminals meet NEMA-ASA standards of clamp type for single conductors. Special sizes and types are available. Insulators are NEMA-standard units.
Federal Pacific Electric Co, Newark, N. J.

Turret . . .

. . . increases work capability of Polecat derricks and diggers. The Uni/Dyne turret may be used interchangeably with the entire Polecat line. The rotation system, powered by a hydraulic motor, operates through a planetary gear system and spur-gear train to turn a worm (supported in the turret housing) around the main worm gear—rotating the turret 375 deg in either direction. All gears run in a bath of oil. The worm and worm gear lock instantly in case of power failure, preventing any loss of boom control. The turret can be installed in 14 in. of mounting space and has a maximum over-all height of 32 in. No external chains, sprockets, exposed gears or cables are needed for turret rotation.
Pitman Manufacturing Co, Grandview, Mo.





Hydraulic-Powered Tools . . .

. . . cut conductors, guy strand or tree limbs. The piston-driven tools can be operated from the standard hydraulic source on either an insulated bucket mechanism or truck "A" frame. A press of the trigger actuates the tools through a complete cutting operation. Minimum pressure of 1,000 psi is required to operate most of the tools. Insulated models for working near energized lines up to 69 kv are available.
A. B. Chance Co, Centralia, Mo.

Steam turbine buckets of maximum efficiency are made on this tape-controlled profile miller.

Large steam turbine triple play... from drawing to tape to bucket

At General Electric, turbine buckets with airfoil contours of maximum efficiency are automatically milled to exact tolerances. One result: Increased efficiency with more power from more compact steam turbines.

This high-speed precision production is accomplished with a tape-controlled profile miller. A drawing is translated onto magnetic tape and the tape fed into the milling machine's tape reader. The machine, fully automatic, mills each bucket to identical tolerances.

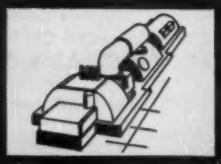
The numerically controlled profile miller is just one of the many precision machine tools used by General Electric to produce the best turbine-generators possible. Other automatic equipment is used for drilling, boring, welding, reaming, tapping, and assembly.

All of these many operations characteristic of modern manufacturing contribute to the quality and performance of each General Electric steam turbine-generator long before it is placed in service. And this quality and performance remain for the many years of each unit's life. 244-10

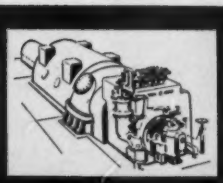
Progress Is Our Most Important Product

GENERAL ELECTRIC

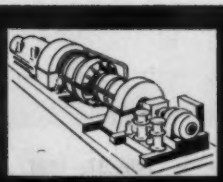
General Electric Turbine-Generators Help Keep Power Costs Low



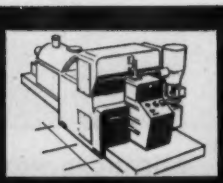
Steam turbine-generators for large blocks of power



Steam turbine-generators 100,000 kw and lower



Gas turbines for peaking, base load, combined-cycles



Mechanical drive steam turbines for auxiliaries

Electrical World

JULY 31, 1961

Management Newsletter

Utilities Watch Auto Talks

What's ahead for the auto industry? Is a strike on the horizon? If so, how long? And what will the effects be on an economy gathering recovery momentum which may speed it to new highs?

All signs point to a speedy settlement, once the oratory is out of the way. Almost no one wants a strike—not the auto makers, who look for a 6.7-million-car year; not United Auto Workers President Walter Reuther, whose bargaining position is none too strong; and not the Kennedy Administration, which wants to minimize domestic problems during the months of deepening international crises ahead.

But it doesn't always work out so simply. Sometimes a key issue turns into a test of strength between negotiators, talks become increasingly bitter and an atmosphere of rancor and antagonism can pave the way for a strike.

A prolonged auto strike would pull more than Detroit down with it, economists agree. At a time when the economy is rebounding sharply, an auto shutdown would at least take the starch out of the drive and possibly trigger a slip back to recession levels.

The 1959 steel strike serves as the best standard of comparison. During the strike, gross private domestic investment fell $9 billion (annual rate) from the previous

quarter. It's not seriously disputed that the steel strike inhibited recovery from the 1958 recession. An auto strike could produce similar effects, but it shouldn't reach quite as deeply into other industries.

Local suffering would be heavy, though. Electric utilities in auto-dominated areas would be in for hard times, and load reductions would appear in satellite industries throughout the country. The latter effect would be dependent on a strike of some duration—say, over a month. And veteran observers feel that there isn't much chance of this happening.

Opening salvos from both sides have been fired, and though the tempo of statements is rising in frequency and sharpness, the atmosphere is still relatively amicable. Reuther opened the maneuvering by announcing at an April UAW convention a set of "flexible" demands to be presented to the industry's big three—General Motors, Ford and Chrysler—when contracts expire August 31. Rather than offering a standard or similar package to each of the three, which in 1958 showed signs of increased cooperation in labor contract matters, Reuther is sounding out each auto maker on different points.

General Motors, wealthiest of the companies, is the target for direct wage proposals. The union proposes that GM immediately give salary status to certain hourly employees, mainly technicians, and then work out a program to transfer all workers to salary status over the next two or three years. GM has been the leading innovator in money bargaining in the past—it originated the annual improvement factor in 1948. The resulting productivity increases and the GM-originated cost of living clause alone have accounted for 51¢ per hour of the over-all UAW increase of about $1.50 per hour since 1948.

The giant automaker has apparently shrugged off the salary demand, but it has not flatly rejected other union proposals. It did hint that it would drive a hard bargain on wages. GM also wants a long-term contract.

Chrysler Corp has been offered eight possible methods for cutting down work time to promote more jobs. The UAW pointed out that Chrysler has suffered a drop of 93,000 workers since 1955. The union wants to explore the possibilities of: reduction of the workweek, without loss of pay; reduction of the workday, without loss of pay; reduction of the workyear, without loss of pay; longer paid vacations; additional paid holidays; industrial sabbaticals; earlier retirement; and restriction of overtime. The switch to salaries for hourly workers is also called for.

Ford Motor Co, which earlier this year warned the UAW that the company would not again allow itself to be the main target of the union during negotiations as Ford feels has been the case in the last two contracts, has been tossed one of the most controversial issues. The UAW wants a voice in the determination of the "location, relocation, partial discontinuance and/or discontinuance of a plant or plants . . ." Demands directed to Ford have been mainly non-economic, but that company and the union have been throwing the most pointed barbs at each other. Ford has announced that it unconditionally opposes allowing the UAW a voice in where Ford plants will be built. Ford's intransigeance on this point has been so great that the union has not been pressing the demand recently.

Reuther has said he feels American Motors Co is strong enough to set a pattern for the other auto companies, a fact that recognizes AMC's strong gains. American Motors has in the past asked for and received consideration from the union on the basis of the difficulty of its struggle for a share of the market.

Even with the "flexible" program, Reuther is committed to defend the existing deferred pay raise clauses. The annual productivity improvement increase now adds about 7¢ per hour to each auto wage earner's income, and the cost of living clause adds another two or three cents.

These escalator clauses are heartily disliked by Ford and Chrysler, who would probably be willing to risk a strike to get rid of them. However, they originated at General Motors, and GM shows no signs of being willing to take a strike on these issues. Ford and Chrysler, of course, can't take the risk without GM backing, and the two factors will probably remain in the next contract.

Production figures indicate that the manufacturers are not looking for a strike. If a strike appeared likely, the auto companies would schedule strong production to build up inventories for the dry spell. August production is expected to be the lowest in several years.

Washington isn't gravely concerned either. Despite the saber rattling building up in Detroit, Kennedy Administration officials believe negotiations will end up successfully. In their view this means without a UAW strike and via new contracts of limited proportions.

If Reuther just matches the last auto contracts—six to seven cents in productivity and fringes—he'll be within the boundaries that Labor Secretary Goldberg considers non-inflationary. This implies that the auto firms agree and don't raise auto prices. Goldberg and other Administration officials feel Reuther hasn't been greedy in auto contracts for nearly a decade, mostly because he has been bargaining at a time when the industry is in the doldrums or just coming out of them—as now. Auto wages have been going up much more slowly than those in the steel industry.

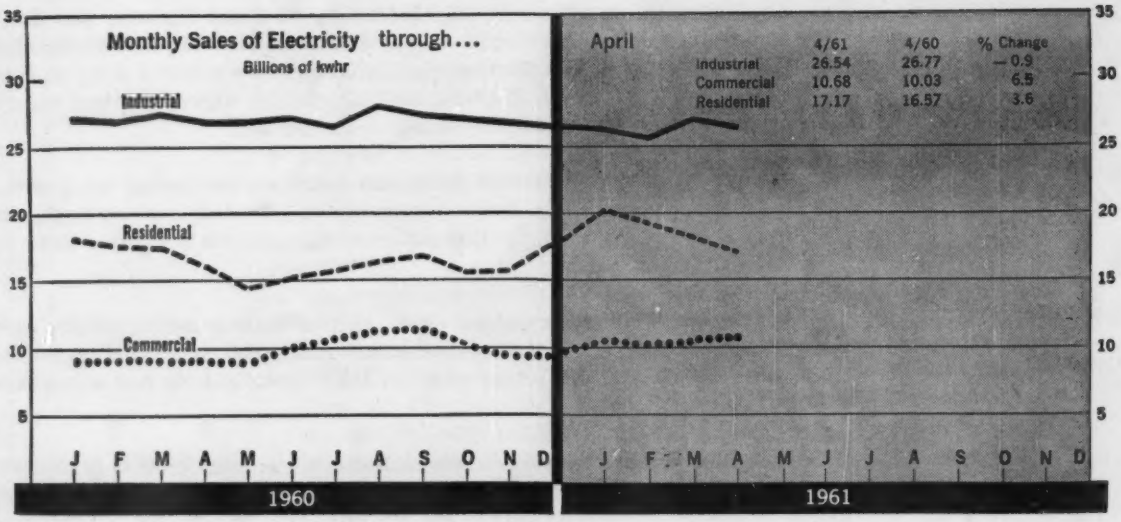
Despite early demands—many of which are largely for public consumption—most observers think that the auto industry will be able to keep control of the final settlement figures. Partially this is because of the soundness of management's economic case, but the short work weeks and unemployment of the recent past tend to dim workers' enthusiasm for walking picket lines. Best current guesses look for a package of five to 15¢ per hour in wages and fringes, with the largest increases in hospitalization and pension funds.

If Washington were really worried that a settlement would be outsized or unlikely, it would apply pressure to the negotiators by warnings of excessive wage and price increases. Warnings will appear from Administration economists if Goldberg feels that the outlook is poor. Part of the silence is due to Reuther's complaint to Administration economists to get off his back while he's negotiating. But there is also a general feeling that all is well right now.

If they guess wrong, a variety of steps would be tried. Goldberg has gone to considerable pains to deny he said an auto strike would be "intolerable." What he said in a recent Detroit speech, is this: ". . . We cannot, from the standpoint of our position in world affairs, have a shutdown in the automobile industry this year. It would be the height of economic folly, when we are pulling ourselves out of recession, and we need, more than anything else, full measure of recovery, to interrupt the progress which we are starting to make . . ." If this isn't saying a strike is intolerable, it's probably because Goldberg didn't think of the word at the time.

Several weeks before the end-of-August deadline, the Administration could rush in federal mediators to help out. Do-it-yourself bargaining is traditional in autos—a fact both sides take pride in. So mediators are not on the scene now. But if talks break down, they will be sent in in force.

If that doesn't work, the most likely step would be to try to get the parties to agree to a fact-finding board. If this is rejected, there is always the Taft-Hartley injunction after a strike gets under way. Goldberg wants to avoid this at almost all costs—but he's determined to halt a long walkout that would hurt the economy. Right now, though, a blowup appears unlikely, and the Administration attitude is hands off, watch what happens, and hope for the best.



Power Statistics

		Latest Month	Year Ago	Annual Change %
Capacity	April	171.86	159.70	7.6
Dec. '60 Peak. million kw	Dec.	128.7	134.0	−4.0
Est. Dec. '61 Peak.		140.5	143.8	−2.3
Production—billion kwhr	April	61.28	58.72	4.4
Hydro		13.84	13.24	4.5
Fuel		47.44	45.48	4.3
Sales—billion kwhr	April	57.02	55.86	2.1
Residential		17.17	16.57	3.6
Commercial		10.68	10.03	6.5
Industrial		26.54	26.77	−0.9
Other		2.63	2.49	5.6
Fuel Consumption	April			
Coal—million tons		13.70	13.31	2.9
Oil—million barrels		6.53	6.33	3.2
Gas—billion cu ft		130.94	130.32	0.5
Net Income Class A & B Co's—$ million	April	156.78	154.86	1.2
Residential Customers—millions	12 Mos.	51.55	50.47	2.1
Revenue per kwhr	ended	2.46¢	2.49¢	−1.2
Avg kwhr per customer	Mar. 31, 1961	3,889	3,680	5.7
Avg annual bill		$95.67	$91.63	4.4

Business Statistics

Indexes:				
FRB Industrial Production (1957 = 100)	June	110	109	0.9
ENR Construction Cost (1949 = 100)	July	179.0	173.9	2.9
BLS Cost-of-living (1947–49 = 100)	May	127.4	126.3	0.9
New Orders for Machinery (1950 = 100)	May	177	189	−6.3
NEMA Sales				
Insulation materials	May	129	134	−3.7
Electric appliances	April	78.3	85.3	−8.2
GNP—annual rate—$ billion	4th qtr.	503.5	486.4	3.5

Significant Changes: Industrial production continues to rise. June level is up 7.6 from March level of 102.4 and is just below the record of 111 set in January 1960.

THE NEW PITMAN POLECAT™

WITH EXCLUSIVE

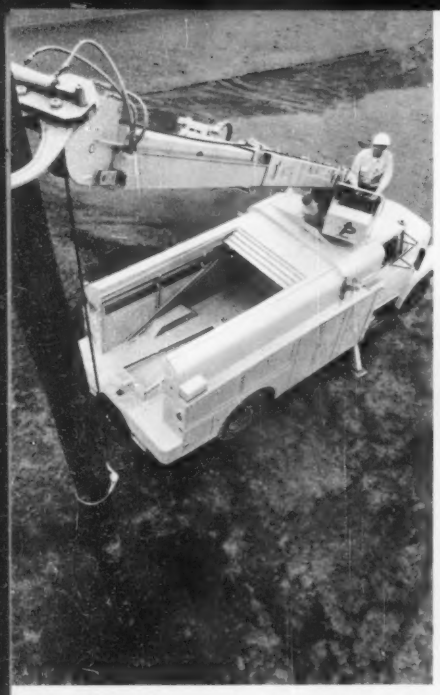
UNI/DYNE TURRET™

The Pitman Polecat, introduced in 1960, quickly enabled electrical utilities to set new standards of safety, performance and increased crew efficiency. But, successful as it was in replacing muscle with hydraulic power, we knew that even the finest machine *can* be improved.

Accordingly, we focused our attention on the "heart" of the Polecat—the head-unit, which swings and lifts the extendible boom. By taking a completely *new look* at this unit . . . by refining the design of each part, and combining functions wherever possible, we developed the exclusive Pitman Uni/Dyne Turret.

It is stronger and more durable, with rotation system completely contained within the cast steel head—there are no chains, sprockets, exposed gears, cables, or other compromises. Rotation locks instantly when power is removed, provides bedrock stability for digging or lifting materials and men.

Uni/Dyne Turret is extremely compact, enables Polecat unit to be mounted virtually *anywhere* on a utility line truck—new, or in-use. Pitman Polecats, with exclusive Uni/Dyne Turret, are standard on center-mount, corner-mount and top-mount models, and on new top-mount with operator seat. Turn this page for more details!



TOP-MOUNT POLECAT operator has job under full control as he sets this utility pole. Lifting with cable, he grasps pole with the exclusive hydraulic Pitman Pole Claw; then, by rotating his Uni Dyne Turret and inching the "stinger" in or out, he positions pole precisely and holds it steady for tamping.

CORNER-MOUNT POLECAT loads 5,000 lb. transformer into its own truck bed; also unloads, lifts and positions unit aloft. Polecat assembly goes in either rear corner; controls are in opposite rear corner, or Polecat can be remote controlled. Lifting capacity of any model Polecat is 8,000 lbs.

CENTER-MOUNT POLECAT, shown with fiberglass boom extension locked into the extendible boom-tip. Can support one or two fiberglass buckets for work as high as 43′ aloft. Nonconductive rope on extension lifts transformers 39′ up. Operator stands on either side of unit, with duplicate controls.

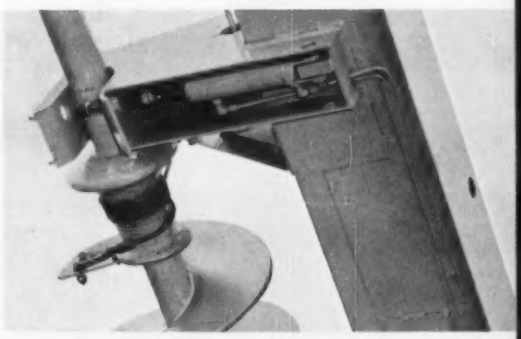
NOW ALL POLECAT™ MODELS FEATURE

UNI/DYNE TURRET™

BY PITMAN...

leader in development of new hydraulic lifting and digging equipment for electric utilities

Uni/Dyne Turret is standard in all Polecat models – center-mount, corner-mount, top-mount, as well as the new top-mount type which rotates operator right with the head-unit. Note Uni/Dyne's clean, uncluttered design, with entire rotation mechanism enclosed and running in a bath of oil. There are no exposed hydraulic lines to snag. Uni/Dyne Turret housing is of cast steel, stress-relieved, for far greater strength.



POLECAT FEATURES include this hydraulically-operated retaining pin (optional), which locks digger into carrying bracket along boom, after digger has reeled itself into position. Another exclusive mechanism automatically transfers digger head from main boom to extendible stinger. There are no exposed hydraulic hoses or fittings; no pressurized sliding tubes to leak; all hydraulic lines run within the boom.

OPERATOR RIDES right along with Uni/Dyne Turret on new top-mount Polecat, can sight along boom in any position. Turret rotates 375° in either direction, digs holes in a circle from 27′ to 42′ in diameter. Self-locking rotation mechanism provides rigid base for digging under toughest conditions, for lifting heavy loads precisely.

To see this remarkable machine in action, call your Pitman Utility Distributor for a thorough demonstration. Or, simply contact...

PITMAN MANUFACTURING COMPANY

12727 PITMAN ROAD • GRANDVIEW, MISSOURI
TELEPHONE SOuth 1-1851
PITMAN MANUFACTURING (CANADA), LTD., TORONTO

Computer, Teletype Speed Product Service

An automatic "30-min order-processing" system is completely changing the product distribution concepts of Westinghouse Electric Corp's apparatus products group.

Westinghouse now gives, as a matter of routine, faster delivery to 15,000 customers although closing some field warehouses, drastically reducing the stocks of others, and shipping more and more products directly from its many apparatus products manufacturing plants—all in the face of rising sales volume. The two to four days an order previously spent in the mail and the two additional days required for its handling at the shipping point is being replaced with a 30-min processing cycle. Even in cases where sales office and warehouse are in the same city, the 30-min cycle is said to cut a full half-day off the former order-processing time.

This system already has resulted in reduced inventory costs—a cut from $5 million to $2.7 million in the inventory level of small motors and controls; reduced warehousing costs; and improvement in cash flow of at least five days. Similar advantages are beginning to be achieved in distribution equipments.

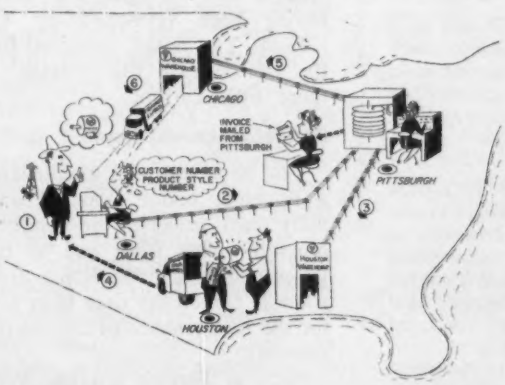
The apparatus products group, one of six Westinghouse product groups, markets stock items such as motors, distribution transformers and meters, as well as custom-made equipment such as turbine-generators, power transformers and large switchgear. Stock items account for about 55% of the orders received, although custom-made equipment represents a greater dollar volume.

Complete customer information, inventory and cost data on some 42,000 of these stock items manufactured by 19 plants are stored in the memory unit of a dual IBM Ramac (Random Access Method of Accounting and Control) 305. Order information from Westinghouse's private teletype network is processed by computer—using its 20-million-digit memory. The network connects the company's sales offices, field warehouses and plants.

Daily, more than 90 of the company's sales offices teletype 1,500 to 1,600 orders to an order-processing center in Pittsburgh. These are sent in brief, coded form to reduce message traffic. The incoming information is converted from paper tape to punched cards and processed through the computer.

The computer locates the stock at the warehouse nearest to the

(*Continued on page 55*)

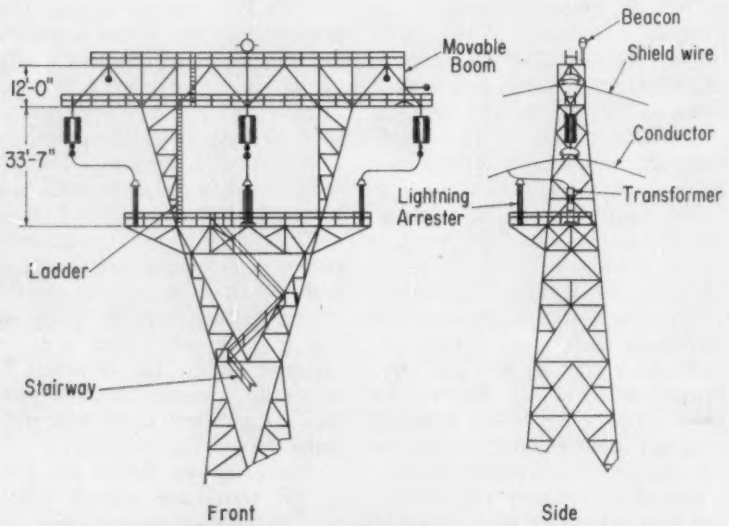


(1) Customer transmits order to a local sales office. (2) Local teletypist codes order; transmits to order-processing center (Pittsburgh). (3) Pittsburgh computer determines nearest warehouse (Houston) can fill order. Teletype receiver in Houston warehouse prepares shipping forms, updates inventory records, etc. Simultaneously, invoice is automatically prepared and mailed from Pittsburgh to the customer. (4) Houston warehouseman uses teletyped forms to put order on truck for Dallas. (5) Had Houston warehouse stock been temporarily "out-of-stock," Pittsburgh computer would have reviewed inventory of other warehouses—say, Chicago. Order request would have been teletyped to the Chicago receiving machine. (6) As in the case of the motor shipped from Houston, motor is shipped in less than an hour after original order placement.

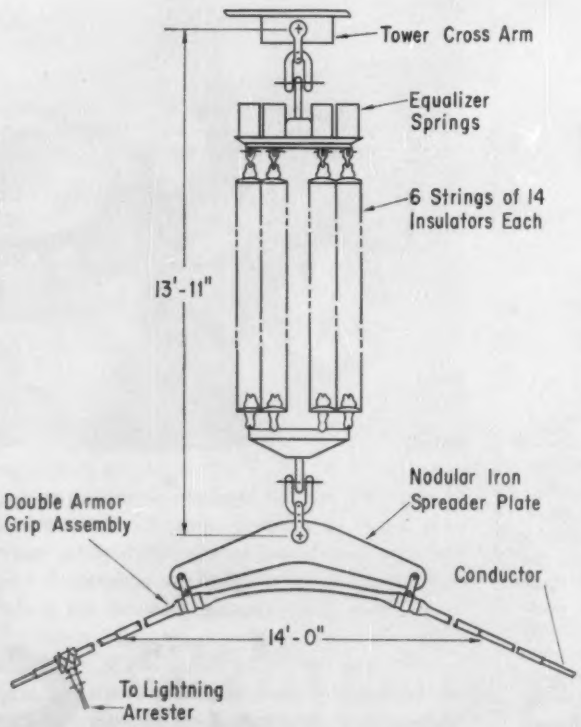
COMPUTERS, located at orders-processing center, are fed sales orders on punched cards. Computer then checks its inventory records and locates merchandise, searching first at the shipping point nearest the customer. It then updates its inventory files, reducing them by the order quantity assigns an invoice number to the order, prices it, extends it by the correct multiplier, discounts it, applies sales and use taxes where applicable, and inserts the proper warehouse-type address code. It completes its operations by preparing invoice and statistical cards, and reorder cards for items which have dropped below the order review point

uplift leg reaction exerted by a calculated mass of rock. The tower structure was attached to the leg footings through a stub angle grouted in the rock hole. This stub angle, matching in size the bottom tower leg section, is set at the same pitch in the rock hole as the tower leg.

Besides rock embedment of the stub angle, supplementary anchor rods were drilled and grouted in the periphery of the cored tower leg hole to bond lamination in the rock structure. Depth of the concrete pedestal was a function of the depth of bedrock below the established grade for the base of the tower.



DETAILS of river tower top include 1,800-lb lightning arresters, movable boom, beacon, ladder and stairway, transformer, and conductor, shield wire positions



CONDUCTOR SUSPENSION ATTACHMENT has six strings of 14 insulators each, conductor being held by a grip assembly allowing longitudinal movement

Two shielding wires arranged to radiate a 30-deg cone of protection over the outside phase wires are intended to minimize damage from lightning strikes, voltage surges, and other possible lightning effects. Tower accessories include lightning arresters at each phase-wire position on both river towers and at each phase-wire position on the anchor structures. Earth grounding on all tower legs is through buried counterpoise wires, driven grounds, or buried anodes of a capacity to insure resistivity not exceeding 10 ohms.

Warning lights, in accordance with FAA regulations, are mounted on each corner of the river towers at specified levels, and a flashing beacon surmounts the tower. FAA regulations specify that span wires be marked with daylight warnings as well as those for darkness. The daylight warning device is a 20-in. sphere painted aviation orange. Such spheres hang on the two shield wires and on the outside conductors on 300-ft center, staggered.

The night warning system is 12 illuminated neon tube lights attached to the center conductor at uniform spacing. Designs for the spheres and the lights are special, having been developed by Con Edison. The lights, energized from the transmission line voltage, require little current.

Gondola Travels Span

For inspection and maintenance, a traveling boom mounted on a dolly truck traverses the conductor crossarm truss from end to end. Its principal function is hanging a gondola cab on the river span wires for the maintenance of the warning spheres.

General Electric Co and Westinghouse Electric Corp have facilities on the towers for their lightning research projects. For gathering data on the shape, frequency, and severity of lightning discharges to tall transmission structures, these instruments were installed:

1. Counters in series with the lightning arresters.
2. A kine-klydonograph for studying "prestrike" phenomena.
3. Automatic oscillographs for recording shape and magnitude of lightning surges at the tower top and on the shield wires.

Speed Product Service

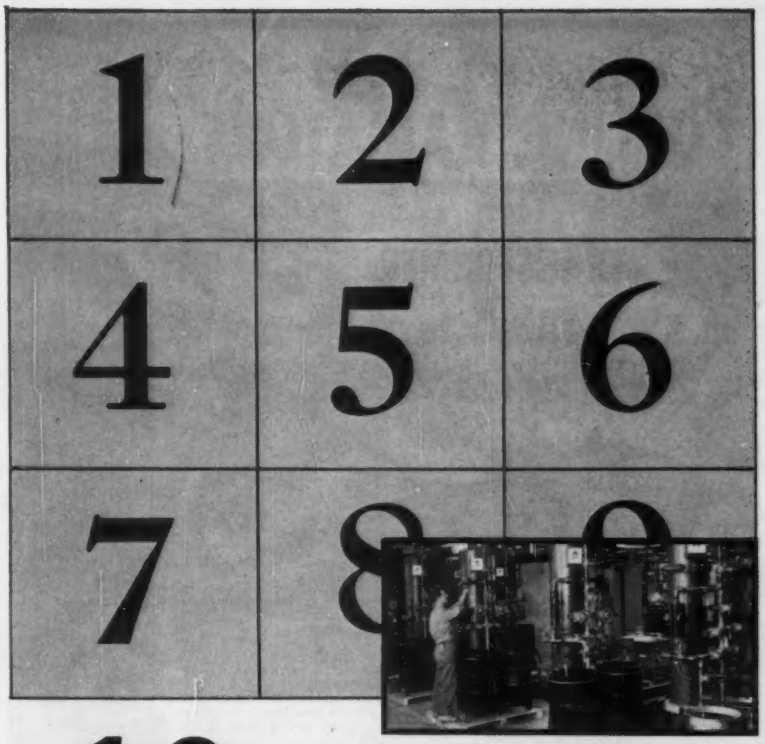
(*Continued from page 53*)

customer, updates inventory records, and punches out statistical and invoice cards. The latter are used first to print invoices on an accounting machine. Then, data from them is converted to tape and transmitted to the warehouses. There it is received on teletypewriters which produce the complete shipping orders.

Applying this system to the complete chain of operations from order entry through shipping has reportedly produced a host of additional benefits.

- Up-to-the minute information is available on all apparatus product inventory balances—and just where the inventory is located—at all times. This, as well as warehouse cutbacks, has been a considerable factor in inventory reductions. Yet, back orders have been drastically reduced because the smaller total inventories are properly balanced.
- A report of the most active items, based on the same up-to-date information, is on each salesman's desk every Monday morning—telling him how many of which products are in stock, and where. In addition, a salesman can inquire of the computer, via teletypewriter at any time, for the status of a specific item in a specific warehouse or in a number of warehouses.
- This same inventory data goes to each of the group's manufacturing plants, where it is the current information necessary for efficient production planning. It is supplied as often as requested.
- The computer automatically produces punched cards for items with inventories that drop below a predetermined order-review point, to a degree automating reordering. It also provides a wide range of sales and tax statistics and complete financial accounting as a by-product of order processing.

Accuracy checks are built into the system to the degree that Westinghouse voices complete confidence in the correctness of the computer information. Thus, cash flow is expedited by "billing" before shipping, for example. It is reported that, since the chosen warehouse can ship if the computer discloses it has the item in stock, confirmation of shipment isn't required.



10 DAY DELIVERY

ON PERMUTIT BD SOFTENERS AND STANDARD PACKAGED DEMINERALIZERS

Now you can order "off-the-shelf" delivery of these Permutit units—a complete line of economy water softeners and packaged demineralizers. They're in stock now—ready for immediate delivery within ten days after we get your order:

Model BD Softeners: This complete line of Permutit units takes advantage of standardized mass-produced components and a new design, to radically cut the cost of industrial water softening. Shipped in component kit form for easy assembly and fast installation. Available in these sizes and capacities:

Shell Diam.	Straight Height	Flow Rate Average	Softening Capacity
30″	6′	40 gpm	510 kgr
36″	6′	56 gpm	750 kgr
42″	6′	77 gpm	1020 kgr
48″	6′	100 gpm	1380 kgr

Standard Packaged Demineralizers: Permutit's skid-mounted, mixed-bed units require no field assembly, no delays, no capital tied up in construction. Each is pretested and factory-guaranteed. Just make the plumbing and electrical connections and put the unit to work.

Now available on ten-day delivery are the 12″, 15″, 20″ and 24″ sizes, giving you flow rates up to 20 gpm (50 gpm for polishing). All of them can produce demineralized water averaging over 6,000,000 ohms specific resistance, or about 0.05 ppm dissolved solid content.

A small size mixed-bed demineralizer, model MBD-6A, can also be delivered from stock.

Also available for fast delivery: Other types of demineralizers, and fully packaged water treatment systems providing flow rates up to 50 gpm, can be quickly assembled from Permutit's standardized components and shipped to you on accelerated delivery schedules.

For further details on any of these products, write, wire or call our Permutit Division, Dept. EW-71, 50 West 44th St., New York 36, N. Y. (OXford 7-6600). (In Canada, contact the Permutit Company of Canada, Toronto.)

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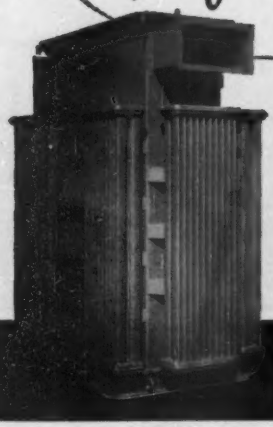

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HAI-2

News About People

Sylvania Appoints Rueger VP and General Counsel

RUEGER

William F. Rueger has become vice president - general counsel of Sylvania Electric Products, Inc, General Telephone & Electronics Corp subsidiary.

Abitibi Appoints Two VPs

Abitibi Power & Paper Co, Ltd, has appointed R. E. E. Costello as vice president-development, engineering and services, and C. H. Rosier as vice president-board products.

PERSONAL BRIEFS

At Memphis (Tenn.) Light, Gas & Water Division, Vice President **W. R. Moyers** has been appointed administrative director. **Calvin Henze** is the utility's new controller.

Myles Myers is the new president of Sacramento Valley Electric League, succeeding **Creighton Johnson. Richard Taylor** was elected vice president.

Jerry Ikalowych has joined the industrial relations department of Commonwealth Services Inc as a consultant on personnel and other industrial relations matters.

In a realignment of executive responsibilities at Florida Power Corp, **W. M. Pickett** has been given responsibility for all six divisions in the utility's 31-county service area; **Andrew H. Hines Jr** was promoted to executive assistant in division operations; and **A. V. Benson** was named vice president in charge of governmental relations.

General Electric Co has formed a central air conditioner section, comprised of the Tyler, Texas, central air conditioner plant and the Trenton, N. J., furnace plant. **W. J. McCullough** is general manager of the new section. **Benjamin F. Bennett** was named general industry engineering manager in GE's industry control department, Salem, Va. **Robert F. Paling** became heating control sales manager in GE's appliance control department, Morrison, Ill. **John A. Light** was appointed manager of communications and community relations for Hotpoint division. GE named **John T. Castles** chemical materials department general manager. He succeeded **Dr A. Eugene Schubert** who was named power transformer department manager (EW, July 10, p 104).

A. Conant Moulton has become director of public relations for Fairbanks, Morse & Co.

Oliver W. Durrant has been named manager of a newly created automation and control section in the engineering department of Babcock & Wilcox Co's boiler division.

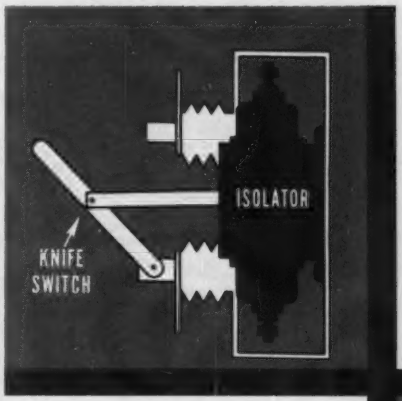
The following have been named branch managers of Univac division of Sperry Rand Corp: **Clifford G. Zimmer Jr** in Cleveland, Ohio; **Henry Stelzer** in Denver, Colo.; **Peter D. Wick** in Omaha, Neb.; **Allan H. Bibby** in Jacksonville, Fla., and **Robert A. Wolf** in St. Louis, Mo.

New manager of national account sales for Electric Autolite Co is **Richard D. Kelly.**

J. Earl Templeton has been appointed western operations director for P. R. Mallory & Co, Inc.

OBITUARIES . . . Sidney Alling, 73, retired general sales manager of Rochester Gas & Electric Corp . . . **Robert J. Askin,** executive vice president with Abitibi Power & Paper Co, Ltd . . . **R. K. Turner,** 59, Union Carbide Corp vice president . . . **Harry F. Naramore,** 43, east central region apparatus engineer at Cleveland, Ohio, for Line Material Industries, McGraw-Edison Co.

ISOLATORS
are the most practical disconnect you can buy!



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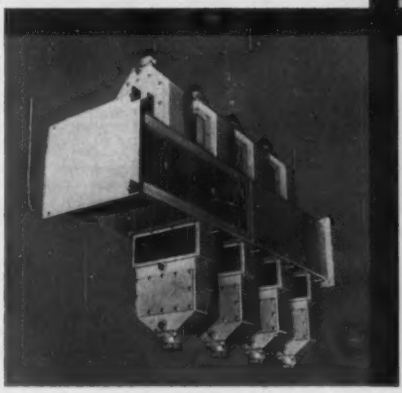

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QU.	KVA	MFG.	VOLTAGE
1	12000	G.E.	115,000—46,000 L.T.C.
1	10000	West.	67,000—34,500, 3 Ph. Auto.
1	7500	West.	66,000—13,800, 3 Ph.
1	7500	West.	66,000—2400/4160, 3 Ph.
1	3750	G.E.	69,300—13,200, 3 Ph.
1	3000	G.E.	69,000—4340, 3 Ph.
6	1667	West.	66,000—2300/4000
3	1250	G.E.	69,300—2400/4160
6	750	Wagner	66,000Y—13,200
4	333	West.	67,000—7200/12470Y
2	2500	Wagner	45,000—4160Y, 3 Ph.
1	5000	West.	34,500—13750/6875, 3 Ph.
1	4500	West.	33,000—2500/4330, 3 Ph.
3	3333	Penna.	34,500—6900/11950Y
2	3000	Upgf.	34,750—4160, 3 Ph.
2	1500	G.E.	34,400—2520, 3 Ph.
3	1250	A.C.	33,000—480
4	750	Wagner	33,000Y—6900
3	500	Mol.	34,500—2300/4600
3	200	A.C.	34,500—2400/7200/12470Y
1	3750	West.	22,900—4160Y, 3 Ph.
2	3000	G.E.	13,800—2640, 3 Ph.
1	2500	G.E.	13,800—2400, 3 Ph. Unit Sub.
3	667	G.E.	13,200—240/480
1	600	Stand.	13,200—2300, 3 Ph.
1	450	Penna.	13,200—2400, 3 Ph. Askarel
1	4500	West.	7,245—2300, 3 Ph.
1	1500	Wagner	4160/2400—600, 3 Ph.
1	1000	A.C.	2400/4160—240, 3 Ph.

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1 — 4600 Kw, 60 cycle, 13800 volts, Generator
6500 Hp, 25 cycle, 11000 volts, Motor—300 Rpm

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3—2500 KVA G-E 69000—2400/4160Y
3—2500 KVA G-E 69000—7200/12470Y
4—2500 KVA W-H 34500—2400/4800
3—1500 KVA G-E 69000—2400/4160Y
3—1500 KVA G-E 69000—7200/12470Y
4—1000 KVA Mol 7200/12470Y—4160
3—1000 KVA G-E 34500-7200/12470Y
3—1000 KVA Wag. 34500—2400/4160Y
3— 833 KVA W-H 43800—480
3— 500 KVA Penn. 13200—120/240
3— 333 KVA W-H 13200—2400/4160Y
3— 333 KVA G-E 2400/4160Y—240/480
3— 333 KVA Wag. 2400—120/240
1—1500/1875 KVA Mol. 3-Ph. 40,500—4800 F/C equipped
1—1500/1875 KVA Mol. 3-Ph. 34,500—2400 F/C equipped

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Sacramento Municipal Utility District, P. O. Box 2391, Sacramento 11, California.

Meetings Calendar

AUGUST

Western Electric Show & Convention—Cow Palace San Francisco, Aug. 22-25.

American Institute of Electrical Engineers—Pacific General Meeting, Hotel Utah, Salt Lake City, Aug. 23-25.

American Society of Mechanical Engineers—International Heat Transfer Conference, University of Colorado, Boulder, Aug. 28-Sept. 1.

American Institute of Mining, Metallurgical, & Petroleum Engineers—Third Annual Semiconductor Conference, Ambassador Hotel, Los Angeles, California, Aug. 30-Sept. 1.

SEPTEMBER

Association of Illinois Electric Cooperatives—Annual Meeting, Springfield, Illinois, Sept. 6-8.

Northwest Public Power Association—Power Use Section Annual Workshop, Pacific University, Campus, Forest Grove, Oregon, Sept. 6-8.

National Rural Electric Cooperative Association—Region IV Meeting, Columbus, Ohio, Sept. 7-8; Region V Meeting Eau Claire, Wisconsin, Sept. 11-12; Region III Meeing, Mobile, Alabama, Sept. 25-26; Region I meeting, Richmond, Virginia, Sept. 28-29.

Rocky Mountain Electrical League—Annual Fall Convention, Jackson Lake Lodge, Moran, Wyoming, Sept. 10-13.

Edison Electric Institute—AGA Accounting Section Organization Meeting, The Netherland Hilton Hotel, Cincinnati, Ohio, Sept. 11-12; Meter and Service Committee, Hotel Leland, Springfield, Illinois, Sept. 24-27; Industrial Relations Committee, Annual Round Table Conference, Drake Hotel, Chicago, Sept. 25-27.

Engineering Management Meeting—Sponsored by AIEE, ASME, Hotel Roosevelt, New York City, Sept. 14-15.

Public Utilities Association of Virginia—43rd Annual Meeting, The Greenbrier, White Sulphur Springs, W. Virginia, Sept. 14-15.

American Institute of Electrical Engineers—Petroleum Industry Conference, Jung Hotel, New Orleans, Sept. 17-20.

NEMA—Technical Committee, Power Circuit Breaker group, NEMA office, New York City, Sept. 19; Codes and Standards Committee, NEMA office, New York City, Sept. 28-29.

Electric Companies Public Information Program—1961 Workshop Conference, Brown Palace Hotel, Denver, Sept. 20-22.

Northwest Electric Light & Power Association—54th Annual Meeting, Sheraton-Portland Hotel, Portland, Sept. 20-22.

Missouri Valley Electric Association—Accounting Conference, Sheraton-Jefferson Hotel, St. Louis, Sept. 21-22; Sales, Rural and Home Service Conference, President Hotel, Kansas City, Sept. 27-29.

National Power Conference—Sponsored by American Institute of Electrical Engineers, and American Society of Mechanical Engineers, St. Francis Hotel, San Francisco, Sept. 24-27.

Pennsylvania Electric Association—Accident Prevention Committee, Bellevue Stratford, Philadelphia, Sept. 25-26; Annual Convention, Bellevue, Stratford, Philadelphia, Sept. 27-28.

Southeastern Electric Exchange—Accounting Section, Atlanta Biltmore Hotel, Atlanta, Sept. 28-29.

OCTOBER

American Gas Association—Annual Convention, Dallas, Texas, Oct. 1-4.

Electric Council of New England—Management Training Course, Bald Peak Colony Club, Melvin Village, N. H., Oct. 1-7; Residential Sales Workshop, Hotel Wentworth-By-The-Sea, Portsmouth, N. H., Oct. 2-3; 5th Annual Conference, Hotel Somerset, Boston, Mass., Oct. 18-20.

• **American Institute of Electrical Engineers**—Middle Atlantic Conference, (Fall Textile) Barringer Hotel, Charlotte, North Carolina, Oct. 5-6; Fall General Meeting, Statler-Hilton Hotel, Detroit, Oct. 15-20.

• **NEMA**—Technical Committee, Hydraulic Turbine Section, The Greenbrier, White Sulphur Springs, W. Virginia, Oct. 5-6.

Electrical World's Fifth Electric Heating Conference—Sheraton-Park Hotel, Washington, D. C., Sept. 25-26.

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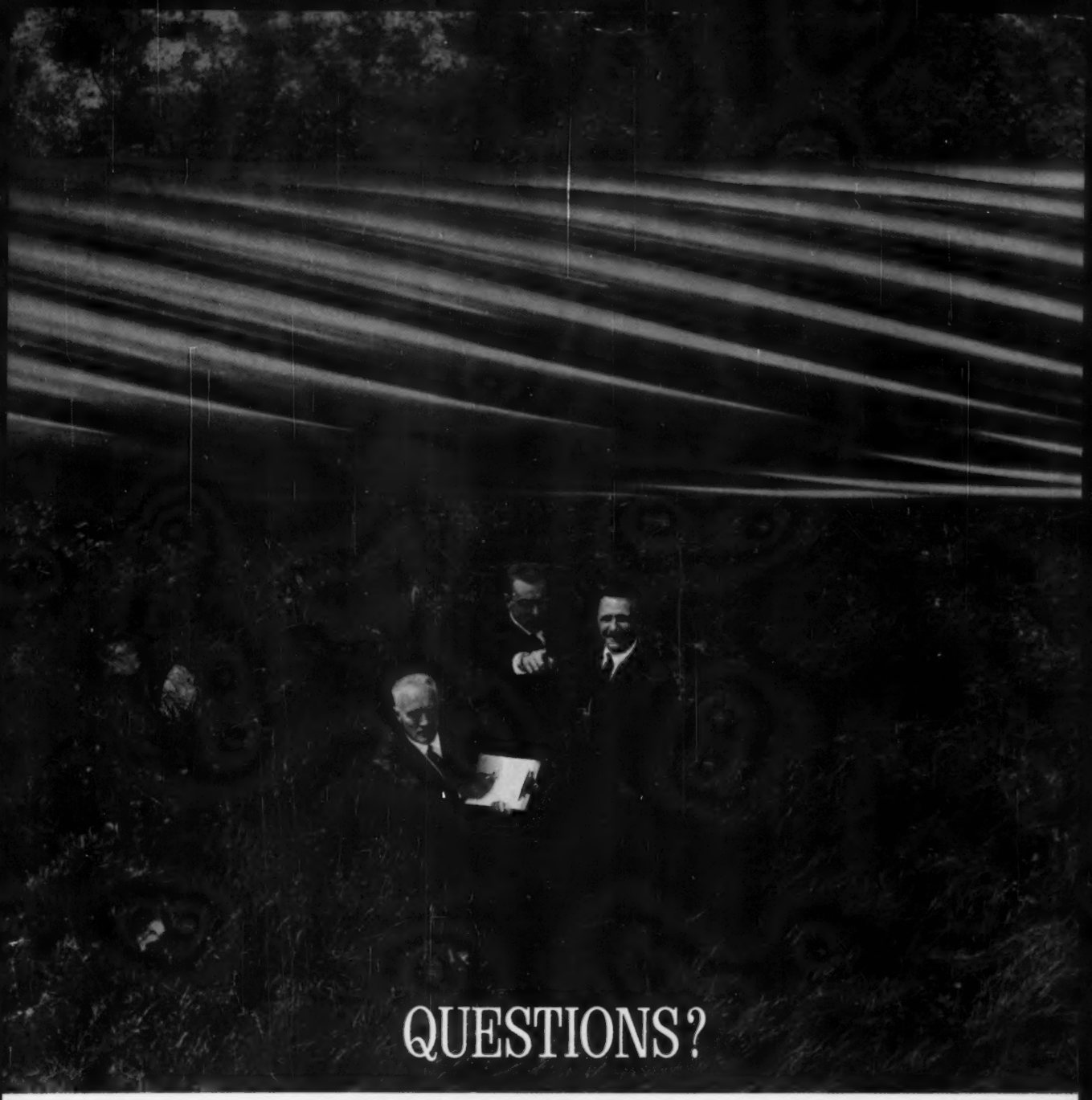

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The job assigned to these people and their extensive equipment is this: Test. Try. Re-test. Try again. Evaluate what's been done, what's being done, what should be done.

Find out anything and everything that applies to overhead aluminum conductor. Electrical load. Temperature. Tension. Vibration. Connection.

And finally, *anticipate*. Be able to answer questions before they are asked. Because pioneering is a continuous obligation.

Our past accomplishments in all forms of aluminum conductor you may already be familiar with. The future we'd like to help you work on now.

If you'd like to know more about the many subjects on which we can provide answers, write to Rome Cable Division of Alcoa, Dept. 1-71, Rome, New York.

ALCOA
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DIVISION

This modern automobile and this Kuhlman transformer have one thing in common... *they both have the same finish!*

DuPont "*LUCITE*" Acrylic Lacquer, the same weather-resistant, performance-proven finish used on modern automobiles for the last several years, is now offered on Kuhlman pole-type transformers.

Millions of modern-day automobiles and extensive Kuhlman laboratory tests prove *LUCITE* finish stays brighter—weathers and chalks less than ordinary paints. Its acrylic content, as opposed to alkyd types, keeps the finish beautiful and bright for a much longer period of time.

4 Step Transformer Protection

Drawing on the success of the automotive industry, DuPont and Kuhlman engineers developed a 4-step process to assure the same results for transformers: (1) First, all surfaces are thoroughly cleaned; (2) Then, a primer is applied to prevent corrosion; (3) Next comes a sealer to assure adhesion and prevent chipping or peeling; (4) Finally, a coat of high-luster, weather-resistant *LUCITE* Acrylic Lacquer, with the lowest erosion rate of any finish available today.

What *LUCITE* has done for automobiles, it will now do for your transformers. Get this wonderful, new finish at no extra cost on your Kuhlman transformers this year.

KUHLMAN TRANSFORMERS

KUHLMAN ELECTRIC COMPANY, Birmingham, Michigan

Manufacturers of transformers since 1894

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